

PUBLIC WORKS

Aug.
1960

RECEIVED
AUG 1 1960
FEDERAL BUREAU OF INVESTIGATION

County Master Plan for
REFUSE DISPOSAL
page 87

Design Data for
SEWAGE PUMPING
page 89

How A Turnpike Schedules
PAVEMENT
MAINTENANCE
page 95

Reservoir Study on
RAW WATER QUALITY
in Impoundments
page 97

Waste Treatment Used For
WINTER OLYMPICS
at Squaw Valley
page 102

THE QUALIGRAM . . .
A Visual Aid for
Water Quality Appraisal
page 120

COMPLETE CONTENTS
ON PAGE 5



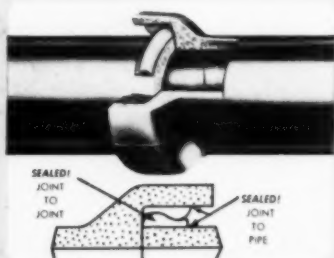
Robert D. Bugher (seated) and Lloyd A. Dove. Mr. Bugher is Executive Director of APWA which holds its convention in New York City this month. Mr. Dove is Director of Research for APWA. See page 18.

PUBLIC HEALTH BEGINS AT CITY HALL



Sanitation, a vital element, but . . .

Sewer System *only as good as* House Connections



Inferior quality house connections to sewer mains pull the big line, however well designed, back to inferior level. Infiltration in small lines discharges excessive ground water into the main, taxing its capacity . . . Wedge-Lock* Clay Pipe helps cities beat this problem. . . . Four through six-inch diameter Wedge-Lock in house connections gives triple protection against infiltration, exfiltration and roots. Reduces load in sewerage. . . . Reduces plant pumping. . . . So *safe*, it can be used *under* basement floors. Conforms to ASTM Specifications C 425-58T, Type 1. Put it in *your* plumbing code.

* Pat. T.M. Reg. U.S. Off.

WLC-480-7

Wedge-Lock® CLAY PIPE

THE FACTORY-JOINTED CLAY PIPE AVAILABLE NATIONALLY FROM LOCAL MANUFACTURERS

Write to any of these manufacturers for literature or a Wedge-Lock demonstration

Cannelton Sewer Pipe Company Cannelton, Ind.
The Clay City Pipe Company Uhrichsville, Ohio
Graff-Kittanning Clay Products Worthington, Pa.
Larson Clay Pipe Company Detroit, Mich.
Lehigh Sewer Pipe & Tile Company Fort Dodge, Ia.

The Logan Clay Products Company Logan, Ohio
The Owensboro Sewer Pipe Company Owensboro, Ky.
Pomona Terra-Cotta Company Greensboro, N. C.
The Robinson Clay Product Company Akron, Ohio
Superior Clay Corporation Uhrichsville, Ohio

from **Chicago**

The NEW

FLUSH KLEEN® System

TWO MAJOR DESIGN IMPROVEMENTS

1. NEW FLO-THRU STRAINER ... permits greater solids loading

2. NEW BY-PASS FITTINGS

(including special By-Pass Valve and separate By-Pass inlet line to wet well)

... allow greater inflow capacity

... permit pump selection based only on discharge capacity

PROVIDES THESE ADVANTAGES

- Lower original costs ... smaller pumps and motors required
- Pumps handle clear liquid only
- Absolute reliability—pumps cannot clog
- Reduced maintenance
- 100% standby capacity
- Longer pump life

NEW ... Successfully handles high wet-strength paper products

NEW ... Successfully handles ground garbage

NEW ... Increases maximum solids loading capacity

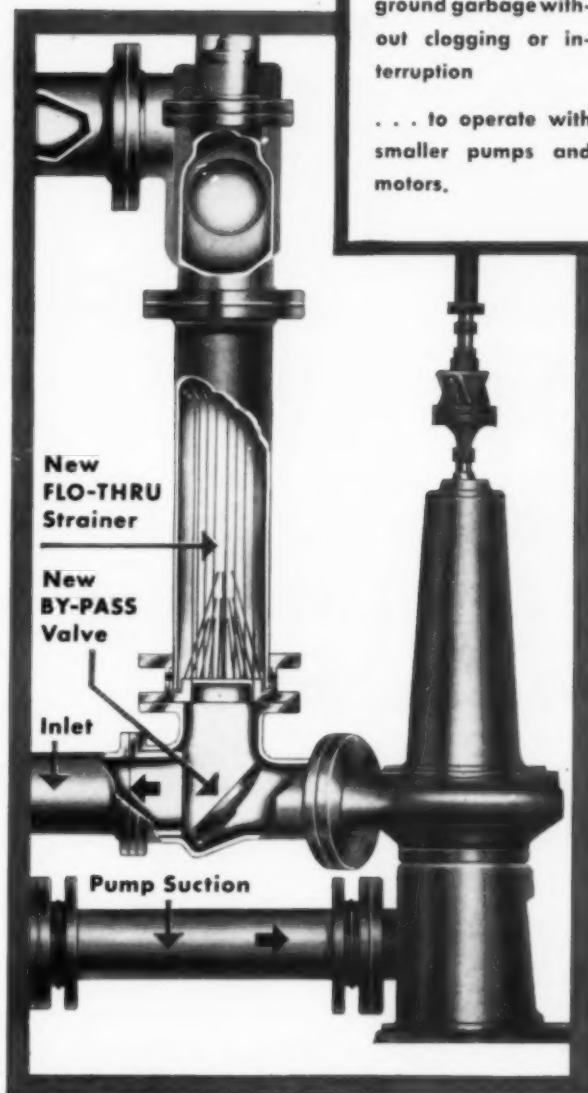
NEW ... Uses smaller pumps and motors

OVER 13,000 FLUSH KLEEN® INSTALLATIONS FOR:

- Municipalities • Industrial and Commercial Buildings • Schools • Institutions • Hotels
• Hospitals • Motels • Auditoriums
• Subdivisions • Ships

Write for Bulletin No. 122-D

© 1960—CP



COMPLETELY REDESIGNED

... to handle modern high solids loadings of wet-strength paper products and ground garbage without clogging or interruption

... to operate with smaller pumps and motors.

SOLIDS NEVER REACH THE IMPELLER



Putting Ideas to Work
FOOD MACHINERY AND CHEMICAL CORPORATION
HYDRODYNAMICS DIVISION
CHICAGO PUMP

622F DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

NOW choose from two No. 112 Motor Graders to get the best for your job

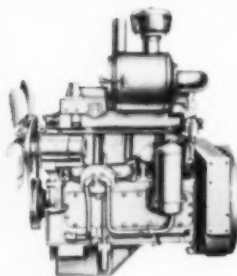


THE 85 HP NO. 112E Increased power, plus other quality features, keep the No. 112E out front in the 21,000 lb. class.

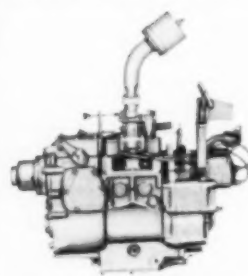


THE 100 HP NO. 112F The new, turbocharged No. 112F will earn its keep with high production and low operating costs.

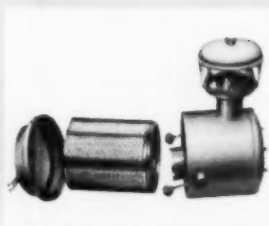
**No other motor graders in
the 85 HP to 100 HP range
have all these features**



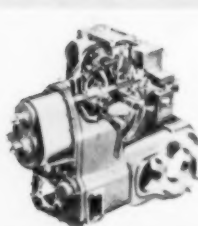
New compact engine: 85 HP in the No. 112E. Turbocharged 100 HP in the No. 112F.
Result: better lugging ability, long life, easier servicing.



Vertical starting engine: standard on both models.
Result: easy, all-weather starting.



Dry-type air cleaner: standard on both models.
Result: removes 95.8 per cent of air-borne dirt from engine intake every service hour. Takes only five minutes to service.



Oil Clutch: standard on both models.
Result: up to 2000 hours of operation without adjustment.



Improved blade controls: standard on both models.
Result: precise adjustment, easy engagement—anti-creep lock makes blade stay put under load.



In-seat starting: standard on both models.
Result: finger-tip convenience and positive starts.

MORE and more municipalities, counties and townships are finding that the production and economy of Caterpillar Motor Graders save taxpayers' money. You can see the proof of this by asking your Caterpillar Dealer for a demonstration on your job. He backs up every machine he sells with reliable parts and dependable service to protect your investment.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**TAXPAYERS GET
THEIR MONEY'S WORTH
WITH CAT-BUILT MACHINES**

AUGUST, 1960 • Volume 91, Number 8

County Prepares a Master Plan for Refuse Disposal	87
<i>Plan for Orange County, Calif., considers disposal site capacities, transfer stations, to serve a rapidly growing population.</i>	
Design of Sewage Pumping Stations	89
<i>Engineering and economic factors involved in the design of sewage lift stations and selection of pumps.</i> H. H. BENJES	
Pedestrian Tunnel Overcomes Traffic Bottleneck	94
<i>Metal liner plate structure moves pedestrians out of narrow underpass.</i> JOSH HALBERT	
Pavement Maintenance on the Ohio Turnpike	95
<i>Three-way scheduled maintenance includes care of slab foundations, joints and edges and the pavement surface.</i>	
Limnology and Quality of Raw Water in Impoundments	97
<i>Comprehensive study of a reservoir reveals specific biological and chemical characteristics of each layer of water.</i> CHARLES M. WEISS AND RAY T. OGLESBY	
Squaw Valley Fringe Area Sewage Treatment Plant	102
<i>When the Winter Olympics came to this small community, unusual pollution control problems were encountered.</i> PHILIP N. STORRS	
"Do-It-Yourself" Street Sweeping Proves Lowest in Cost	104
<i>Study of street sweeping costs points to economy of municipal operations; experience proves estimates were accurate.</i> E. FREDRICK BIEN	
Hangar Modification Thwarts Steel Strike	105
<i>Larger aircraft housed in hangar modified with locally available steel.</i> JOHN K. BRIGHT	
Sanitation Costs Cut 31%	107
<i>Cost-conscious supervision and use of paper bag can liners pare refuse collection costs for Fredericksburg, Virginia.</i> CLIFFORD RUSCH	
Rubberized Sealants Protect New Civic Center Garage	111
<i>All traffic and parking areas in Detroit's Civic Center garage are specially treated.</i>	
De-Slicking Asphalt Surfaces	112
<i>How research and experimentation in Indiana improves existing pavements.</i> MERL J. FORD	

Emergency Public Works Services in Civil Defense	114
<i>A discussion of the vital functions of public works personnel in the event of a nuclear attack emergency.</i> BARENT F. LANDSTREET	
Reservoir Clearing Operations Yield a Profit	116
<i>Sale of merchantable timber makes clearing work profitable despite strict control of contractors' work.</i> H. KENNETH ANDERSON	
Tunnel Sealed Against Tidewater	113
<i>Quick setting mortars and plastic sealant plug flowing joints in utility tunnel.</i>	
Lime Recovery at a Water Treatment Plant	119
<i>Materials handling at the lime recalcining plant of the Dayton, Ohio, Water Department.</i>	
The Qualigram—A Visual-Aid Device for River Data Appraisal	120
<i>This isometric representation shows river quality with respect to range.</i> E. J. CLEARY	
Sealing a Small Dam	123
<i>How repairs made without draining a reservoir stopped 1 mgd leakage.</i> GORDON E. THOMAS	
Progress . . . Promotes Street and Highway Program	124
Road Commission vs. Beavers	126
Clean-Up Week Proclamation	127
Traffic Control Problems and Solutions	144
High-Level Lighting for Heavily Traveled Highway	148
<i>Wisconsin Highway Department uses new ideas on 3-mile lighting project.</i> WAYNE N. VOLK	
Use of Mechanical Aids in Public Land Acquisition	150
Weight and Volume of Municipal Refuse	166
Rock Salt Freeze-Proofs Refuse Trucks	166
What We Do and Do Not Know About Chemical Pollutants in Water	194
Dredging Projects Boost County Development	202
Community Center Offers Many Activities	212

PUBLIC WORKS DIGESTS

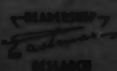
Highways and Airports	136
Sewerage and Refuse	158
Water Works	170
Industrial Wastes	188

EDITORIAL DEPARTMENT

W. A. Hardenbergh, Editor
Edward E. Rodie, Managing Editor
Clayton M. Billings, Lloyd G. Byrd,
Helen E. Quinn, Associate Editors
Alvin Jacobson, Digest Editor
Nathaniel Pavette-Dart, Art Consultant

DEPARTMENTS AND SECTIONS

The Editor's Page	7	APWA News Bulletin	129
Leaders in Public Works ..	18	News of Engineers	203
Reviews of Catalogs	34	Municipal Power	206
Legal Notes	60	Equipment News	222
Ed Cleary Says	70	Worth Seeing	231
Books in Brief	78	Worth Telling	232



Established 1896
Public Works T. M. Reg. U.S. Pat. Off.

Published Monthly by Public Works Journal Corporation, Office of Publication at Orange, Conn. Editorial and Advertising Office at 280 So. Broad St., Springfield, New Jersey. Subscription rates: U.S.A. and possessions, \$6.00. All other countries, \$7.00. Payment in national currencies accepted at Orange, Conn.

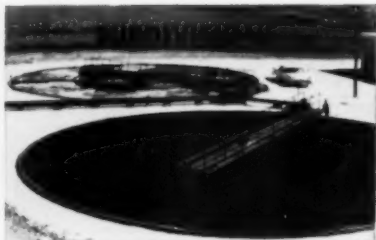


PUBLIC WORKS JOURNAL COFF
280 So. Broad St., Springfield, N. J.

WALKER PROCESS

SPARJAIR COMPLETE SEWAGE TREATMENT PLANTS

Designs for all Developments and Land Planning Projects



Hampton Pk. (Hsg. Devel.), Ill.—1 mgd tot. cap.



Finn Trailer Ct., Ill. (365 units)—45,500 gpd.



Hillcrest Shpg. Ctr., Joliet, Ill.—50,000 gpd.

Sparjair units overcome previous objections to locating a plant near residences, shopping areas, schools, etc. Its new but proven principle of Contact Stabilization aerates and thoroughly oxidizes all odor producing wastes.

Nested design provides complete treatment equal to large municipal plants.

1. Permits development of outlying, low cost land.
2. Capacities from 50 to 5000 population equivalent.
3. Eliminates septic tanks and drain fields.
4. Virtually automatic—Simple operation.
5. Approved by Health Authorities.
6. Odor free — no septic or stale operations.

Details and layouts are available to Consulting Engineers and their Architects, concerned with the design of package sewage and water treatment plants. Write factory at P. O. Box 266, Aurora, Ill. for complete information.

Walker Process also offers CLARIPURE Package Water Purification Plants—pre-designed capacities from 50 to 600 gpm.

WALKER PROCESS EQUIPMENT INC.

**FACTORY • ENGINEERING OFFICES
LABORATORIES**

AURORA, ILLINOIS

ZF PREFABRICATED PUMPING STATIONS



THIS IS THE STATION THAT IS PREFABRICATED



AND DELIVERED



READY TO OPERATE

A PACKAGED UNIT—completely shop-fitted with quality components throughout. Transported to job site ready for installation.

SIMPLIFIES LOCATION—underground operation permits use of existing public property such as parkways, etc. Saves cost of surface property and enclosing structure.

ECONOMICAL—saves costs and time. Prefabrication results in lower construction costs and less time at job site. Simply set in place, connect and start up.

ZF

ZIMMER & FRANCESCON

P. O. BOX 359, MOLINE, ILLINOIS

COMPLETE DATA, SPECIFICATIONS AND DRAWINGS AVAILABLE—WRITE



What Industry Must Have

FIRST OF ALL, industry needs land area—for buildings, for storage and for the other manifold purposes that occur in industrial operations; but land alone is only the beginning. Without those public works that made this nation great, industry cannot exist in the competitive atmosphere of today. These vital services that industry must have are roads, water, sewerage and power. Without roads to furnish transportation to and from the plant, both for employees and for materials, operations are impossible. Likewise, a modern and uninterrupted power supply is necessary. These two are the tools without which industry cannot survive. But industry is also men and women and to them must be supplied a safe and adequate water supply; and for the protection of the employees and of the community alike, provision for waste disposal is equally vital.

There are other requirements for a successful industry but the four listed above are basic. Providing them should be high on the agenda of all public works engineers and officials. Because spur-of-the-moment solutions are rarely possible with any degree of satisfaction, long range planning is an essential.

Research Needed for More Effective Mosquito Control

WHEN World War II started and this country was faced with an immense effort to prevent malaria from immobilizing its overseas armies, there were no better mosquito control methods available than those used in World War I. Contrary to popular belief, the chemicals such as DDT have not changed the picture of mosquito control greatly. They are very helpful under many conditions but represent only one of the tools required for a sound program; and aside from them we are still not much in advance of World War I.

Research and development are needed to provide better and quicker ways of drainage and filling and of ground application of chemicals, as by fogs, sprays, dusts or aerosols. Other improvements are needed, also, but perhaps most of all the realization that there is no magic way to eliminate mosquitoes. It still takes a lot of hard and basic work. Research might find ways of making it easier.

Sewage Treatment to Prevent Water Pollution by Ships

OPENING of the St. Lawrence Seaway and the consequent increased shipping in the Great Lakes will intensify the problem of pollution. Some 13,500 ships enter New York Harbor each year; the traffic in many other ports is high. Allowing only 20 persons per ship and assuming the war-time unloading rate for the average freighter of 500 tons per day, an 8,000-ton ship will be in harbor 16 days, not allowing for reloading. In many harbors, a very considerable organic loading can be added to the water. In fact, in busy waterways, substantial pollution occurs merely from the passage of the shipping.

We think it is time that shipping is required to provide against discharge of pollution in areas where this may affect health or create nuisance. There are many excellent package plants for sewage treatment now available; some of these could be adapted to shipboard use. The sooner procedures are established in more areas to control this type of pollution, the better. Solution of the problem is entirely possible, but it may not be easy.

Regulation is No Substitute for Leadership in Engineering

REGULATION, to many of our young engineers, has a heady appeal. Yet if engineering is to progress we need more leadership and less regulation. A companion need to leadership is a study of the engineering organizations of our states, cities and counties. Many new problems are arising in highway maintenance and construction, in sewage and industrial waste treatment, in water supply and in refuse. In too many cases the organization and concepts of twenty years ago still govern; broad objectives may possibly still apply, but not the old means of accomplishing them; clear-cut descriptions of personnel duties may not exist; inherited responsibilities and the dead hand of the past have undue weight.

So an important job is to review the needs; develop ways to accomplish them, using all modern available means; restudy procedures and policies; and come up with that mixture of foresight, skill, knowledge and leadership that is the true heritage of engineering.

Our competition
is



flattering us...

The greatest compliment an advertiser can receive is when his competitors imitate his campaign.

That's why we at the Cast Iron Pipe Research Association feel so proud.

For 30 years we have been telling the public about the water problem.

We were the first to come out with consumer national advertising on this problem.

We were the first to inform the people of the need for action at the community level.

We were the first to furnish materials for local advertising programs.

We were the first to offer a comprehensive community relations plan with all necessary materials.

We were the first to issue a guide-to-action booklet which would serve as a step-by-step manual for responsible citizens.

We have been fighting the nation's water problem for over a generation.

And now other pipe companies are coming out with water campaigns, too.

Thank you, competition.

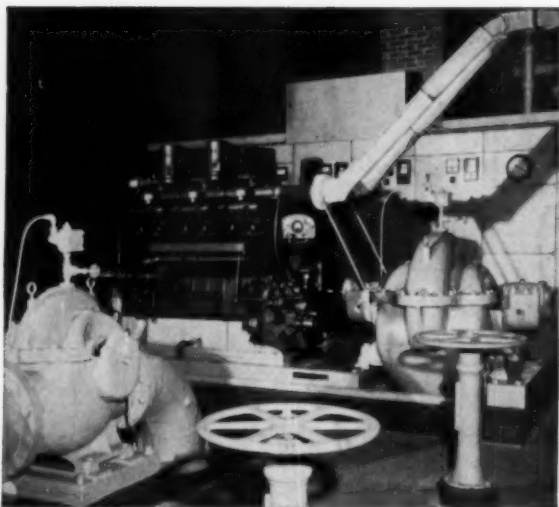
We're flattered.



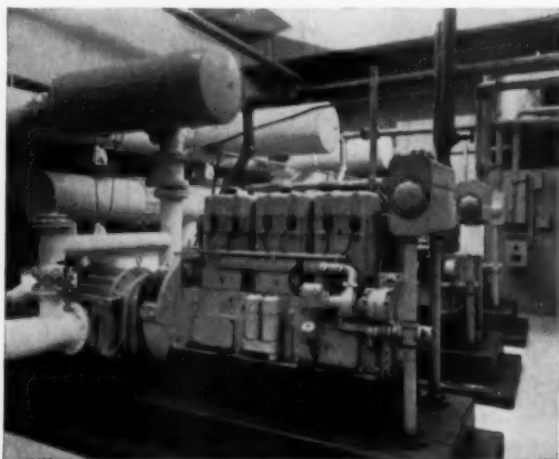
CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE

CAST IRON PIPE RESEARCH ASSOCIATION,
Thos. F. Wolfe, Managing Director,
3440 Prudential Plaza, Chicago 1, Illinois



EAST—North Stamford, Connecticut—water pumping system.

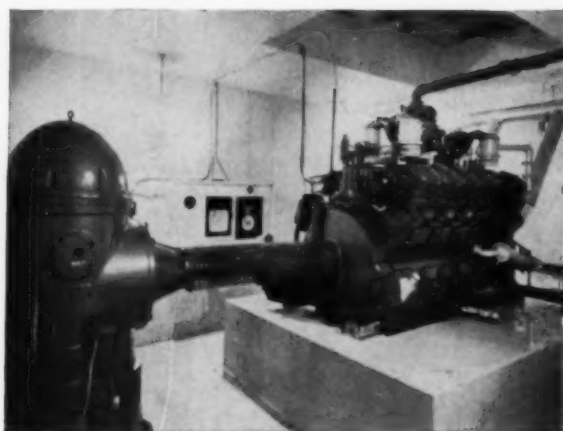


MID-CONTINENT—Waste disposal power in Enid, Oklahoma.



All over the country, municipal and utility plants use ROILINE engines in water supply systems, waste disposal services, and for power generation. Operating on natural or LP gas, or gasoline, ROILINES have been standard in the field for many years.

ROILINE
ENGINES



WEST—Rivers, California—deep well pumping power.

NATURAL GAS RATINGS					600	800	1000	1200	1400	1600	1800	2000	2200	2400
MODEL	Bore & S.	Cyls.	Displ.	Torque-rpm	BRAKE HORSEPOWER AT ENGINE SPEEDS INDICATED									
H570	4 $\frac{3}{8}$ x 4 $\frac{1}{4}$	8	570	457-1400	...	68	86	104	122	139	156	172	188	198
H884	5 $\frac{3}{8}$ x 4 $\frac{1}{4}$	8	884	710-1400	...	105	133	162	189	216	241	261	273	282
F1500	6 $\frac{3}{4}$ x 7	6	1503	1090- 600	125	165	200	215						
H2000	6 $\frac{3}{4}$ x 7	8	2004	1490- 650	170	225	270	290						
L3000	6 $\frac{3}{4}$ x 7	12	3006	2200- 700	250	335	405	435						
L3460	7 $\frac{1}{4}$ x 7	12	3468	2500- 900	285	380	474	555	592 @ 1350					
L4000	7.54 x 7.5	12	4000	3020- 600	345	447	550	635						

With oil pump, water pump, magneto, air cleaner, carburetor, and exhaust muffler. Hp shown is maximum.

Send for literature • SEE YOUR ROILINE ENGINE DISTRIBUTOR

ARIZONA, Casa Grande, Engine Service Company, Inc.
ARKANSAS, Paragould, Wonder State Manufacturing Co.
CALIFORNIA, Long Beach and Bakersfield
 Engine & Equipment Company
COLORADO, Denver, Emrick & Hill Engine & Equip. Co.
KANSAS, Garden City and Great Bend
 Carson Machine & Supply Co.
LOUISIANA, New Orleans, Southern Engine & Pump Co.

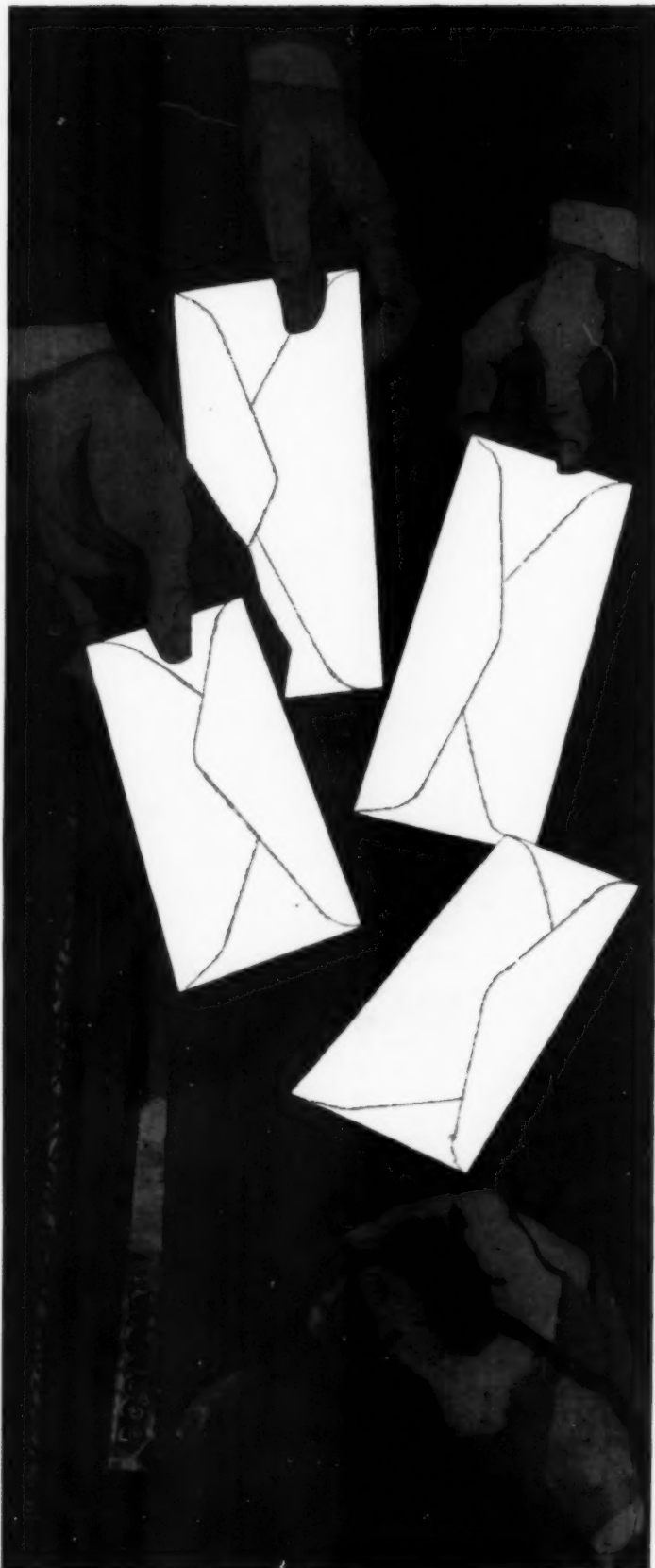
MICHIGAN, Reed City, Hafer Engine Company
MISSISSIPPI, Jackson, Southern Engine & Pump Co.
NEW JERSEY, Kenilworth, Callahan Equipment Co.
NEW YORK, Syracuse, Schenectady and Lisbon
 J. C. Georg Corporation
OHIO, Columbus, Cantwell Machinery Company
OKLAHOMA, Oklahoma City and Tulsa
 Carson Machine & Supply Co.

PENNSYLVANIA, Pittsburgh, P. C. McKenzie Company
 Bradford, R. R. Reck Company
TEXAS, Houston, Dallas, San Antonio, Kilgore, Edinburg,
 Corpus Christi, Beaumont
 Southern Engine & Pump Co.
 Lubbock, Farmers Supply
 Odessa, General Machine & Supply, Inc.
 Wichita Falls, Nortex Engine & Equipment Co.
WYOMING, Casper, Emrick & Hill Engine & Equip. Co.

471-R

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN

New York • Tulsa • Los Angeles
 Factories: Waukesha, Wisconsin and Clinton, Iowa



How to be sure you make the right choice after the Rock Salt bids are in

FIRST consider the company behind the product. What is its reputation, who does it serve, what are its resources? In terms of reputation, service and resources, the Morton Salt Company is the leader in the industrial salt field. Morton's outstanding reputation has been built on years of service to industries and municipalities throughout the United States. Now Morton, America's only nationwide salt company, can offer rock salt for ice control to users everywhere in the country from conveniently located salt sources and warehouses. And Morton numbers among its rock salt customers hundreds of towns and cities and many of the nation's counties, states and toll roads.

NEXT satisfy yourself that the bidder can keep his promise. Make sure he can deliver rock salt from a source near you, the fastest and most economical way. To better serve rock salt customers in the East and Midwest, Morton recently opened a giant new rock salt mine strategically located at Fairport, Ohio. The storage, loading and transportation facilities at the Fairport Mine, like the facilities at other Morton sources, insure you prompt delivery on whatever quantity of rock salt you order.

NOW make your purchasing decision. Base it on your evaluation of the company, its record and its ability to serve you. When you decide on Morton you can rest assured that you have made the wisest choice. You can depend on Morton to give you dependable prompt service on the rock salt you need, when you need it.

**MORTON SALT
COMPANY**
INDUSTRIAL DIVISION



110 No. Wacker Drive, Chicago 6, Illinois

engine power

BY CATERPILLAR

NEW COMPACT DIESEL ENGINES AND ELECTRIC SETS

Announcing a new line of Caterpillar four-cycle Diesels that sharply reduce physical dimensions and weight-to-horsepower ratio. Features of durability, fuel economy and dependability, long associated with Cat four-cycle Diesels, are retained.

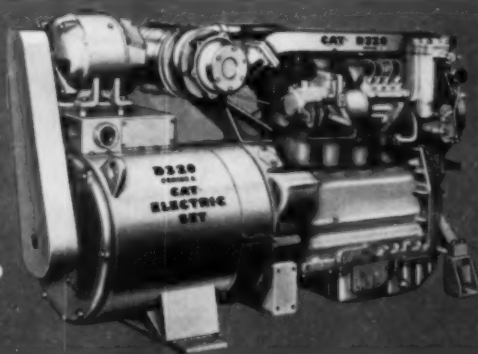
- Four-cycle Premium Performance . . .
at No Premium in Price
- Excellent Service Life
- Turbocharged or
Turbocharged-Aftercooled
- New Compactness
- Less Total Weight
- Exceptional Fuel Tolerance
- Clean Burning of Fuel
- Power-output Ratings Are Realistic,
Horsepower or Kilowatt Certification
on Request
- Available in Industrial, Marine or
Electric Set Configurations

For complete performance specifications on these new Caterpillar Diesels or on the complete line, see your Caterpillar Dealer. Or, write to Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A. Ask for the catalog on the complete Caterpillar Engine line.

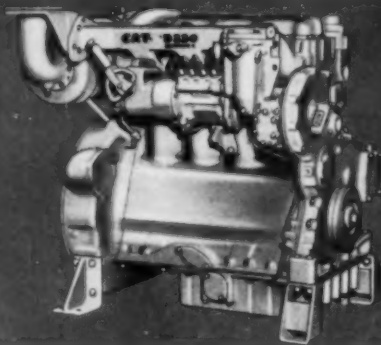
CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

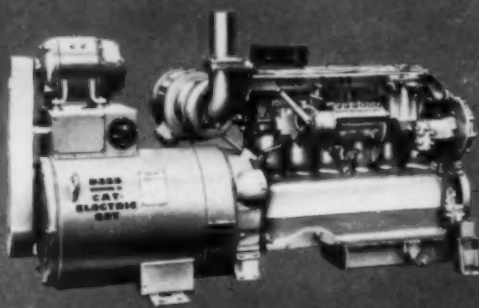
D320
130 HP
60 KW



D330
180 HP
75 KW



D333
270 HP
125 KW



here are 8 reasons why the

ELECTRO-MATIC[®] RADAR VEHICLE DETECTOR

solves more traffic signal problems:

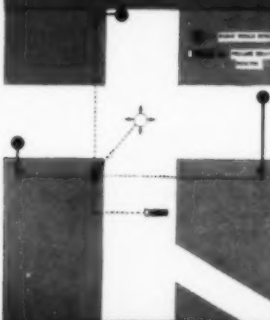


1. Now the new Model ED-2 Radar Vehicle Detector meets requirements of all types of traffic-actuated signal controllers.

2. Inexpensive overhead installation eliminates costly, time-consuming excavations and detours encountered with other detectors.

3. Beam width can be adjusted by remote control to cover from one 6-foot lane, up to three traffic lanes as desired.

4. Operation is not subject to traffic wear and is unaffected by parked cars, weather or excessive radio interference.



5. New "one car equals two impulses" feature permits ED-2 to be used in combination with existing pressure detectors on same traffic phase.

6. Radar Detectors may be easily and inexpensively mounted on existing wood or steel poles using standard luminaire-type mast arms.

7. Mounted on rigid 3-wire span, one or more Radar Detectors can be suspended in positions difficult for other detectors and mountings.

8. Large mast down location of ease of maintenance and removal in the event of roadway changes.

Give your intersections the newest in vehicle detection, and in doing so, save both time and money. Write for Bulletin G-165.



AUTOMATIC SIGNAL DIVISION

EASTERN INDUSTRIES, INC. • NORWALK, CONNECTICUT



4 large trickling filters, Trinity River Authority, West Dallas. Engineers: Forrest & Cotton, Dallas. Contractors: H. F. Allison Co. and Wylie Bros.

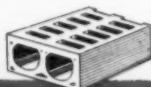
Turn a LIABILITY into an ASSET!

Polluted waters are a liability that progressive communities can no longer afford. Clean them up with trickling filters for domestic and industrial wastes and you attract new industries and increase recreational uses at a community profit. 927 trickling filters went into service between 1945 and 1957 and their construction continues at an unabated rate.

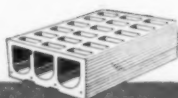
The most vital part of a trickling filter is its underdrain system. When it is of TFFI specification vitrified clay blocks as pictured above lifetime trouble-free service is assured. Specify in accordance with ASTM Specs C 159-59T and demand that they be adhered to and you are safe for years to come. If you lack a copy just ask the nearest member for yours. TFFI Specification vitrified clay underdrain blocks lead the field in resistance to corrosive factors such as acids, alkalis and bacteriologi-



cal action. These blocks not only serve right but are made right—in modern plants under manufacturing controls that substitute materials cannot even approach. (Only TFFI blocks give you a 50-year Guarantee.)



BOSCO
Bowerston Shale Co.
Bowerston, Ohio

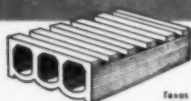


DICKEY
W. S. Dickey Clay Mfg. Co.
Kansas City 8, Mo.



NATCO
Pittsburgh 22, Pa.
327 Fifth Ave.
Harris Corporation

TFFI Trickling Filter Floor Institute



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas



ABMCRE
Ayer-McConell Clay Co., Inc.
Brazil, Ind.



POMONA
Pomona Terra-Cotta Co.
Greensboro, N.C.



TRANSLOT
Connellan Sewer Pipe Co.
Cannelton, Ind.



KINGFISHER ★ OKLAHOMA

Superior's low fuel oil consumption is measured here by (left to right) Clarence Garrett, Plant Supt., A. B. Reese, Jr., White's Chief Field Engineer, and V. V. Long, Engineering Consultant, Kingfisher, Okla.

Civic thrift at Kingfisher prompts Superior Engine purchase

Kingfisher, an Oklahoma wheat belt town of 3700 population, is proud of its low municipal taxation. Earnings from the city-operated power plant pay most local operating expenses and finance periodic improvements and expansion to the plant itself. As usual, city fathers were both cautious and thrift-minded when a new engine-generator was needed recently. Their choice was a Model 80-GDSX-8 dual-fuel supercharged Superior which develops 1769 BHP at 360 RPM, to drive a 1250 KW generator.

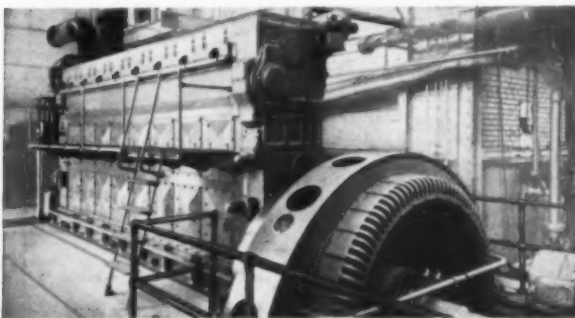
Today many municipalities are making a "Superior decision"! Superior's highly developed open chamber combustion system is combined with a series of exclusive design developments and refinements to produce high power-to-fuel ratio. Diesels can run on a wide range of non-premium fuels including residuals, and dual-fuels operate on natural or manufactured gas, butane, propane or sewage gas. Even after extremely long periods of low-maintenance operation, replacement parts are seldom needed.

Superior's complete line of diesel, dual-fuel and gas engines range from 190 to 2150 HP, or 150 to 1500 KW. Get full information today by writing to:

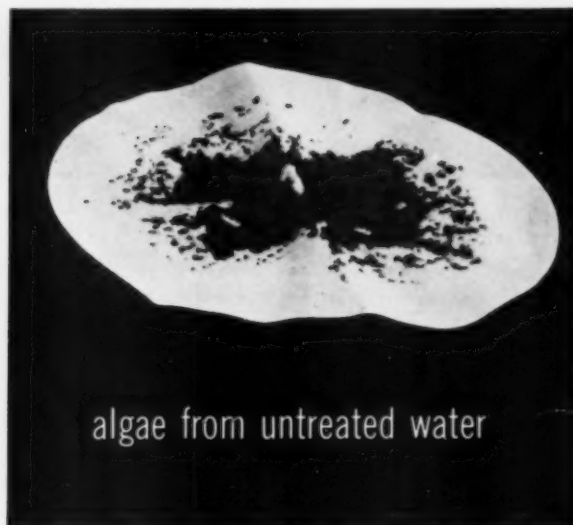
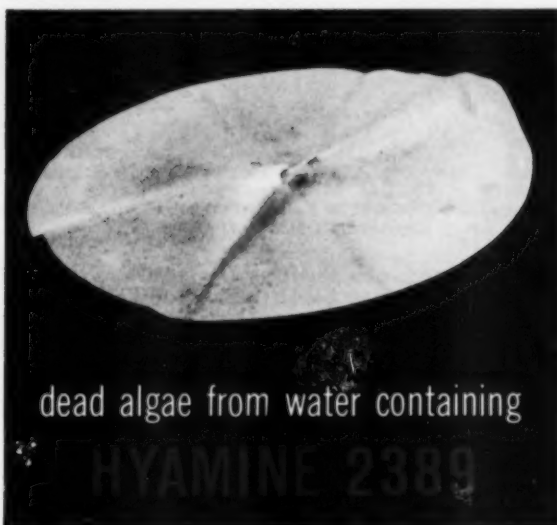
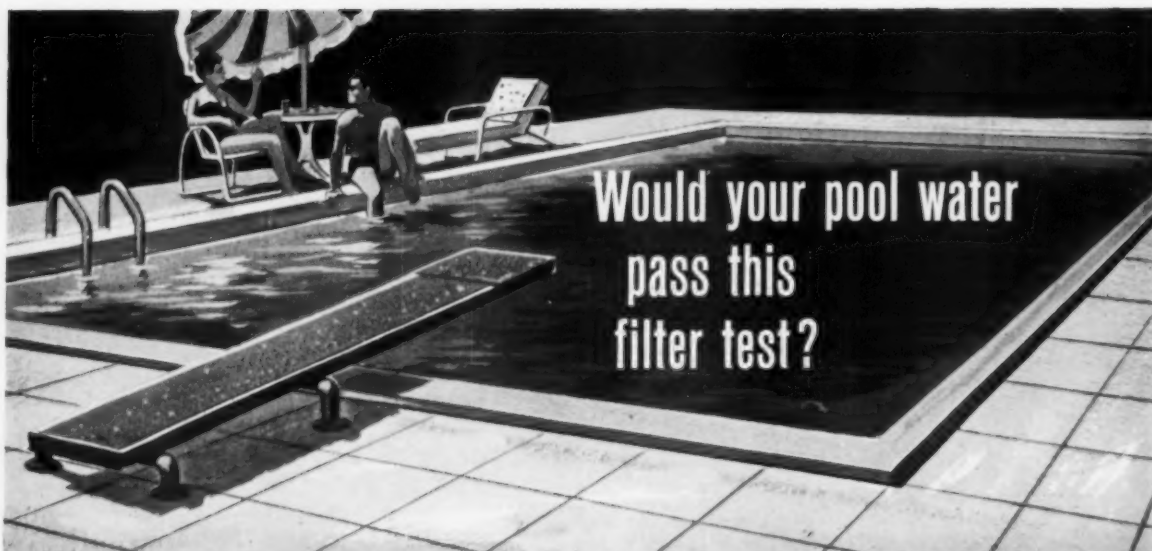


White Diesel

WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
Plant and General Offices: Springfield, Ohio



Kingfisher saved on installation. Experienced power plant crew poured base and completed hook-up.



These filter papers show the remarkable results of a controlled laboratory test on algae growth. Just three ounces of untreated water, when poured through the filter paper on the right, produced the amount of algae shown. The same amount of water treated with algae-killing HYAMINE 2389, poured through the filter paper above, left only slight evidence of dead algae. Proof positive that regular treatments of

HYAMINE 2389 can keep your pool free of slippery, unsightly algae. Helps you save money by cutting down on your use of chlorine, eliminating filter plugging and other maintenance due to algae growth. Formulations based on HYAMINE 2389 also make excellent disinfectants for use in locker rooms. Mail the coupon for information on local brand name products based on HYAMINE 2389.

ROHM & HAAS COMPANY
SANITARY CHEMICALS DIV.
WASHINGTON SQUARE, PHILA. 5, PA.

Please send me information on HYAMINE 2389 for swimming pools... and a list of algicide brands based on HYAMINE 2389.

NAME.....TITLE.....
FIRM.....
ADDRESS.....
CITY.....ZONE.....STATE.....



Chemicals for Industry

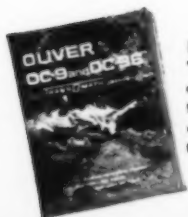
**ROHM & HAAS
COMPANY**

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

HYAMINE is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.



**Five times the work
at half the cost with an
OLIVER OC-96!
TRANS  MATIC**



NEW CATALOG—
"must" reading for cost-conscious cities and towns. Gives complete details and specifications. Ask for your copy.

Ask Joel Jenkins, superintendent of Lower Penna-Neck, New Jersey, township road department, why his town bought an Oliver OC-96 for sanitary landfill operations. "To save money!" he'll tell you. "We get five times the work out of our OC-96 as we did out of the dozer and loader previously used. The OC-96 costs us 100% less to operate than the two old machines!"

Power, speed and ease of operation are OC-96 features that make the difference, according to Mr. Jenkins. "We cover 70 tons of refuse a week with 8" topsoil, as required by state law, and have time left to beef-up muddy truck lanes with 30 cu. yd. of cinders per week and rough-grade an acre of ground every day," says Mr. Jenkins. "The OC-96 is so effortless to operate and such a good all-around machine, we're going to use it on other jobs all over the township."

See and try the great new Oliver Trans-O-Matic OC-96 yourself—the only crawler in its class with these advantages: heavy-duty torque converter, and three types of turns. The OC-96 gives you the job-versatility with greater speed and lower cost every city and town needs. Ask your Oliver distributor for a demonstration.



THE OLIVER CORPORATION

Dept. 2232, 400 West Madison Street, Chicago 6, Illinois

LOOK TO OLIVER FOR YOUR BEST BUY IN WHEEL AND CRAWLER TRACTORS

FOX spreader feature No. 2



Heavy-duty feed auger. Each end mounted outside the box* on dual tapered roller bearings... protected and sealed from abrasives. Easily accessible for once-a-year lubrication.

Heavy-duty auger feed saves 90% on maintenance

Do you get the "winter blues" caused by constant breakdowns of spreading equipment? Do you worry about broken feed apron chains and drag bars? Chances are, if you own other spreaders you've had such experience. Your service men work overtime... plus the 2 or 3 men it takes on the truck.

The solution—Fox Mountable Material Spreaders! Four big, heavy-duty models... 5 to 12 cu. yd. capacities. Highly efficient auger feeder eliminates hundreds of moving parts common to troublesome chain and apron units.



* Exclusive Fox patent.

Even flow saves up to 40% on materials. Easily handles sand, salt, cinders, chips and calcium chloride. Users say maintenance is cut 90%.

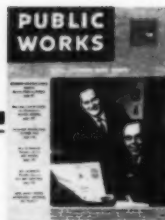
But, materials and maintenance aren't your only savings... you save on manpower, too. It takes only one man to operate the Fox. With Dash-Mounted Remote Controls inside the cab, he starts the 18 H.P. spreader engine, sets spreading rate and flicks on the electric clutch switch. He's in business... smoothly and evenly spreading in widths from 8 to 40 feet, and at truck speeds from 5 to 40 miles per hour. Spreads under cars... ahead of rear truck wheels for added traction. When the job's finished, remove the unit (on or off in only 15 minutes). Frees truck for other work.

To see all the Fox Features ASK FOR A DEMONSTRATION

The Fox Materials Spreader will cut your labor, time and equipment expenses to the bone. A catalog... case history reports... even a no-obligation demonstration are yours for the asking. Write, call or wire collect for the name of the nearest Fox distributor, who will gladly give you a demonstration.

FOX RIVER TRACTOR CO. ROAD MACHINERY DIVISION

Dept. R3, 1020 N. Rankin St. • Appleton, Wisconsin • Phone: REgent 4-1451

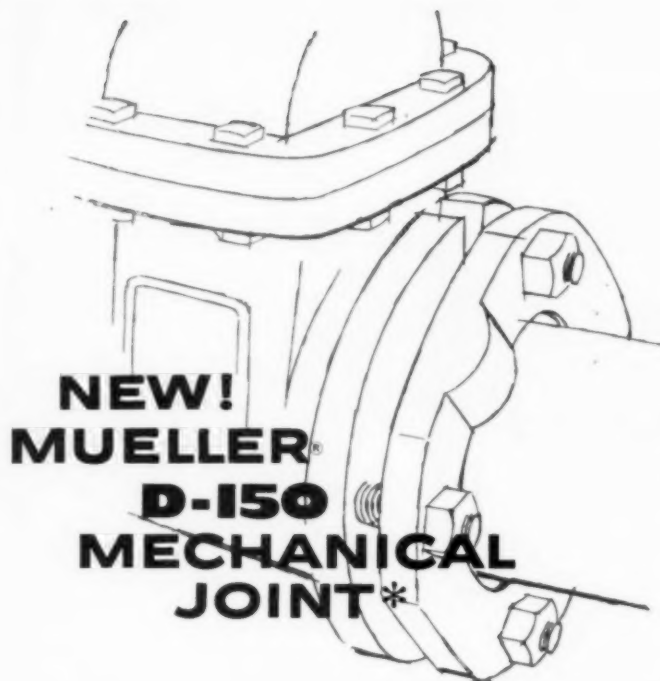


Robert D. Bugher is executive director of the American Public Works Association. He has been with the APWA since 1953 and has served in his present position since 1958. Lloyd A. Dove is director of research for the APWA which position he has held since February, 1960.

In the past few years, the Association has shown a steady growth in both membership and number of chapters. With the formation of the Florida Chapter, now under way, there will be 31 chapters, and the membership now approximates 5,000.

Mr. Bugher has a fine background of experience for his work, having been staff engineer of the Michigan Municipal League; as secretary-treasurer of the Michigan Municipal Utilities Association and as editor of its News Letter. In his present position he is responsible for supervising all activities of the APWA and administering its budget and he is also secretary of the APWA Research Foundation. He served in the Marines during World War II. Now he lives in Park Forest with his wife Patricia, a daughter Vickie Leigh who is 8 and a son Robert, who is 5. His hobby?—APWA. He is a 1948 graduate of Purdue with a BSCE degree and a 1951 graduate of the University of Michigan with a master's degree in Public Administration. He was consulting editor for the 1958 edition of "Municipal Public Works Administration."

Lloyd A. Dove is an Iowa State graduate, 1952, with a BS in Civil Engineering. He worked with Black & Veatch, consulting engineers; was city manager of Nevada, Iowa; served as city engineer and director of public works for Ames, Iowa; and, just before joining APWA, was general manager of E. C. Henningsen Construction Co., Atlantic, Iowa. In addition to APWA, he is a member of ASCE, of NSPE and of Illinois Society of Professional Engineers. He lives in Park Forest with his wife Sylvia and their three children—Jo Ann 11, Stephen 7 and Gary 3. His hobbies are sports, softball, bowling and badminton with the family, when possible.



NEW!
MUELLER®
D-150
MECHANICAL
JOINT*

*...fits all classes
of cast iron pipe
regularly used!*

Now, a single mechanical joint connection can be used with any class of pipe from Class "D" pit-cast pipe to Class "150" centrifugally-cast pipe just by selecting the proper gasket. Only two are needed.

These two gaskets, each accurately sized to the class of pipe, make installations faster, simpler and cheaper. The joints last longer, too, because the accurate fit prevents cold flow and future leaks.

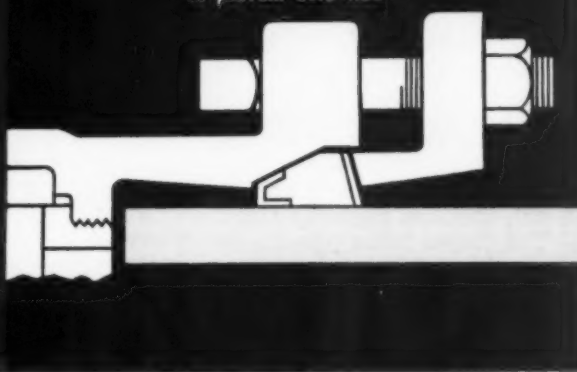
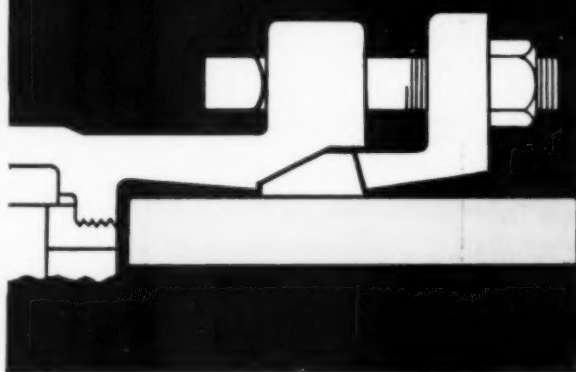
*Write for complete information
and specifications.*

Class "D" Pit-Cast Pipe

(Large O.D. Pipe)
Use Solid
rubber gasket

**Class "150"
Centrifugally-Cast Pipe**

(Small O.D. Pipe)
Use Special rubber gasket
reinforced on both ends
to prevent cold flow



* Now available on Mueller AWWA Improved Fire Hydrants and AWWA Gate Valves. Stock just one type of hydrant or valve for replacement installations in either the new or older sections of your system.



MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario.

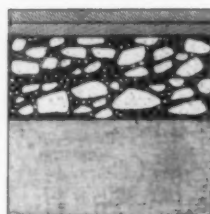


CHEVRON ASPHALT ALL THE WAY



LAYING DOWN THE FIRST LIFT OF ASPHALTIC CONCRETE BASE COURSE

Nello L. Teer Company Job In North Carolina Includes Record Asphalt Paving Award



2-1" lifts Type I-2AC
Wearing Surface

2-3" lifts "Black Base"

7" to 12" compacted
mechanically stabilized base

CROSS SECTION VIEW OF PAVEMENT CONSTRUCTION

On Interstate Route 95, North Carolina, the Nello L. Teer Company, of Durham, North Carolina, is the prime contractor on a highway construction project that includes the largest asphalt tonnage contract ever awarded by the North Carolina Highway Dept.

This project fittingly crowns 50 years of activity in the construction field by the Teer Company.

The job called for new construction of divided pavement each side 24' wide, south from the Harnett County line 14.55 m. to a point 5 m. north of Fayetteville.

The paving contract covered the placement and compaction of 7" to 12" of mechanically stabilized base; placement and compaction of Asphaltic Concrete "Black Base" course in two 3"

lifts; and placement and compaction of Type I-2 Asphaltic Concrete wearing surface in two 1" lifts. Asphalt surface treated shoulders were provided full length over a mechanically stabilized base.

Overall, the "Black Base" and I-2 Wearing Surface required 210,000 tons of Asphaltic Concrete.

All work is being done under Project 8.13438. Sponsor: North Carolina State Highway and Public Works Commission. Resi-

dent Engineer: H. B. Smith; Division Engineer: J. W. Spruill, 6th Division, Fayetteville, N. C.

Chevron Asphalts: supplied by American Bitumuls & Asphalt Company, represented on the job by Sales Engineer George Mitchell.

Across the nation, Chevron Asphalts—backed by outstanding engineering and on-job service—are enabling Road Builders to maintain construction schedules and stretch highway dollars.

Call our office nearest you for complete information.



American Bitumuls & Asphalt Company

320 MARKET, SAN FRANCISCO 20, CALIF.
Perth Amboy, N. J.
Baltimore 3, Md.
Cincinnati 38, Ohio

Atlanta 8, Ga.
Mobile, Ala.
St. Louis 17, Mo.
Tucson, Ariz.

Portland 8, Ore.
Oakland 1, Calif.
Inglewood, Calif.
San Juan 23, P. R.

BITUMULS® Emulsified Asphalts • CHEVRON® Paving Asphalts • LAYKOLD® Asphalt Specialties • PETROLASTIC® Industrial Asphalts

Quality costs less in the long run!

BJ Submersible Pumps

Nowhere is quality more important than in a submersible pump installation where both pump and motor operate down-hole. And that's where BJ quality pays off!

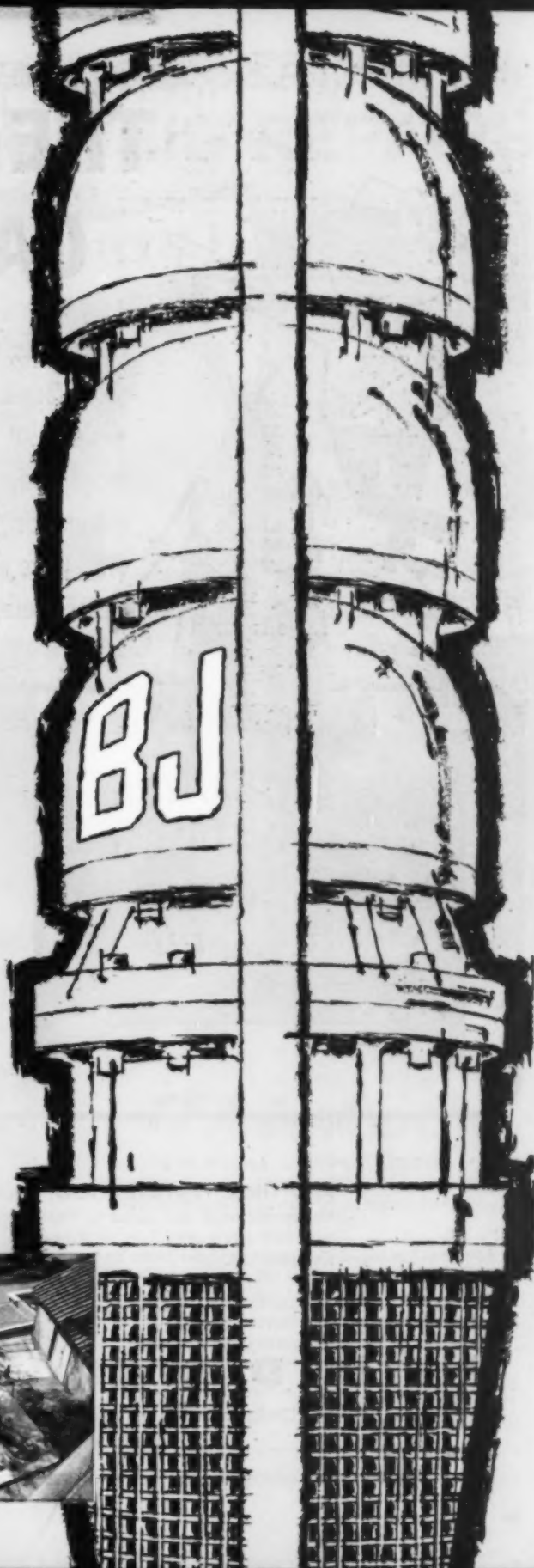
Sealed for life, no adjustments or routine maintenance is required...no noise, no pump house needed, and there is no danger of vandalism or contamination of the well.

As a pioneer in submersible pumps since 1928, BJ manufactures all three basic components—pump, motor and seal—and offers complete unit responsibility with the quality submersible pump. Available in capacities from 20 to 20,000 GPM, heads to 1,800 feet and motors to 450 HP.

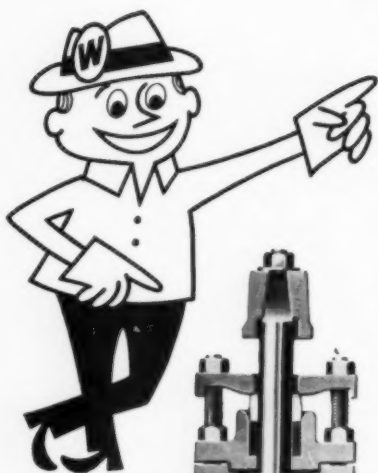
BYRON JACKSON PUMPS, INC.

Subsidiary of Borg-Warner Corporation
P.O. Box 70, Lawrenceburg, Indiana
P.O. Box 2017 A, Terminal Annex, Los Angeles 54, California
Offices in Principal Cities

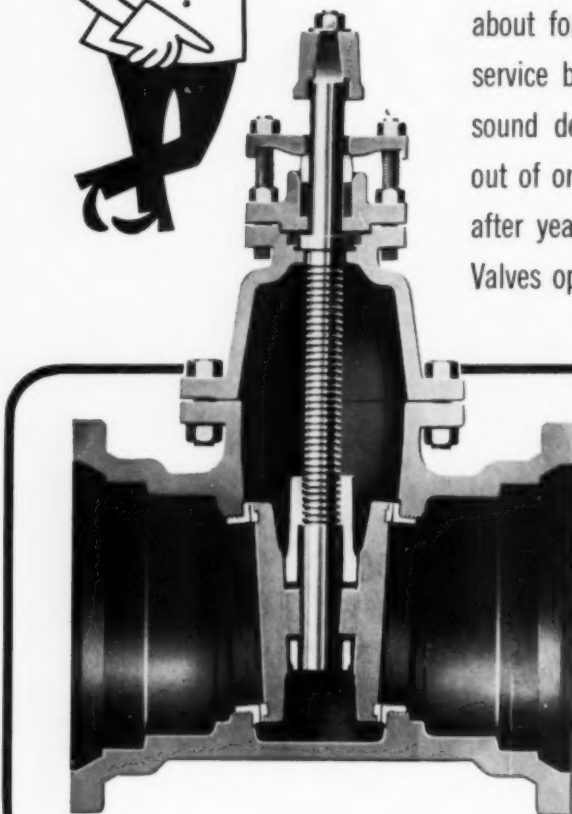
Since 1934, Beverly Hills, California has installed a total of 21 silent BJ Submersibles in some of the most exclusive residential areas in the U.S.



THE R. D. WOOD GATE VALVE



Bury it, yes, and if R. D. Wood made it, you can just about forget it, too. There are generations of reliable service built into the R. D. Wood Gate Valve. Simple, sound design is the secret; no delicate parts to get out of order, no pockets to fill up with sediment. Even after years of idleness in the lines, R. D. Wood Gate Valves operate easily, smoothly.



ONLY THREE MOVING PARTS:

The spreader and two discs comprise the complete internal mechanism. In closing, gates are first lowered into position before spreading action begins. Then spreading pressure is distributed evenly from the hub to permit the discs to seat without distortion. Both discs are equally tight against pressure from either side of valve.

AND THESE FEATURES, TOO: Made of thoroughly seasoned castings, rigidly inspected and tested to 300 pounds hydrostatic pressure. Available with bell, mechanical joint or flange pipe connections; conventional or "O" ring packings.

Conform to latest AWWA specifications

R. D. WOOD COMPANY

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers also of Mathews Modernized Hydrants, Mathews Flange Barrel Hydrants, R. D. Wood Hydrants, and "Sand-Spun" Pipe (centrifugally cast in sand molds)

Concrete Adhesives With THIOKOL Liquid Polymer MAKE LITTLE OF BIG REPAIRS



1. Scaled highway surfaces are being lastingly repaired in only a few hours by bonding new concrete to old with adhesives containing THIOKOL polysulfide polymer. The bond is stronger than concrete itself. Field and lab tests prove it.



2. Only loose and damaged concrete—not the whole slab—need be removed. The adhesive also cuts time and costs in repairing spalled areas, cracks, pot holes, in skidproofing and sealing, in fastening traffic markers. Results are long-lasting.



3. Adhesive with THIOKOL liquid polymer—made and sold commercially by several processors—is spread on prepared surface with brooms or heavy brushes. Thirty minutes later, while adhesive is still tacky, new concrete is poured.



4. Concrete is laid conventionally. It can also be worked out to a feather-edge without danger of later failure—so tenacious is the adhesive bond of new to old concrete.



5. Repair completed—road open as soon as concrete is cured. Similar repairs, in service since 1953, show no damage or effects of weather, wear and tear, even on the busiest highways.

®Registered trademark of the Thiokol Chemical Corporation for its liquid polymers, rocket propellants, plasticizers and other chemical products.

Thiokol®

CHEMICAL CORPORATION

780 NORTH CLINTON AVENUE • TRENTON 7, NEW JERSEY

In Canada: Naugatuck Chemicals Division, Dominion Rubber Co.,
Elmira, Ontario

FOR MORE INFORMATION: Mail Coupon to Dept. CA-53,
Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J.

Please send me THIOKOL's helpful booklet "A
New Type of Concrete-to-Concrete Bonding."
Tells how to reduce remedial time and costs, and
to keep roads in service.

Name

Firm

Street

City Zone State

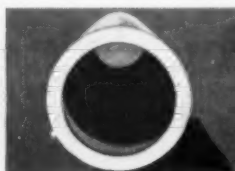
you don't need an "eye"



Keasbey & Matti



Exclusive, patented "K&M" FLUID TITE Coupling forms a permanent leakproof seal as pipe is joined.



Permanently smooth bore keeps pumping costs low. Provides excellent flow characteristics.



out for trouble

after you install

"K&M"

ASBESTOS-CEMENT SEWER PIPE

"K&M" Asbestos-Cement Sewer Pipe helps you provide the best sewer service available . . . with tax savings that go on year after year.

This thrifty pipe is infiltration-proof, even when external water pressure is 25 psi. Prevents your sewer system from reaching full capacity years ahead of schedule, due to water infiltration. "K&M" Asbestos-Cement Sewer Pipe, with exclusive, patented FLUID-TITE Coupling, forms a permanently tight seal.

In planning your system, you can build on flatter grades with "K&M" Asbestos-Cement Sewer Pipe. Need fewer lift stations. The permanently smooth bore of "K&M" Asbestos-

Cement Sewer Pipe has a Manning factor of $n=0.010$. Flow characteristics are excellent. Inspections and treatment loads become less frequent.

This thriftiness carries over into installation. Neither weather nor soil conditions need hold up work. The "K&M" FLUID-TITE Coupling slides on in just two easy steps. Longer pipe lengths minimize the number of joints.

Write today for more detailed and illustrated information on hardy "K&M" Asbestos-Cement Sewer Pipe. Learn why thousands of progressive communities have turned to this durable quality pipe. Write to: Keasbey & Mattison Company, Ambler, Pa., Dept. P-780.

son at Ambler

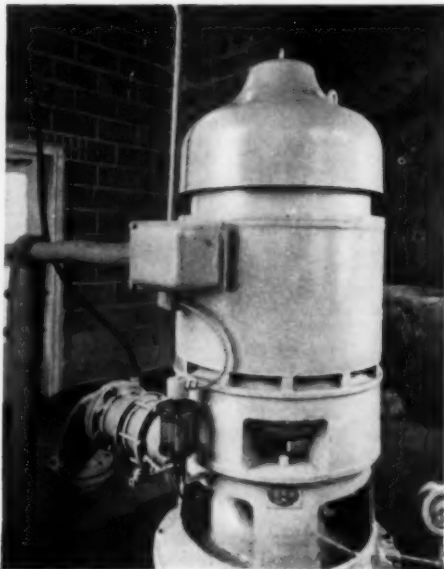


5" deflection permitted per pipe length. It's as easy to install curved lines as straight lines.

"K&M" PLASTIC SEWER PIPE complements "K&M" Asbestos-Cement Sewer Pipe in many sewer systems. Excellent flow characteristics and permanently tight joints. Write for Technical Bulletins on "K&M" High-Impact Styrene-Alloy Sewer Pipe.

**"We have found Peerless pumps
consistently more efficient
and longer lasting
than any other
pump we have used."**

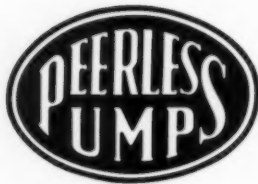
*Says Joseph Kuranz, Manager, Waukesha Water Utility,
Waukesha, Wisconsin*



◀ "Even at our settings (400-500 feet) and with the severe abrasive action of the water bearing aquifers in our hard water area, we plan on getting 10 years service from these deep well turbine pumps before they need maintenance attention. And when we do remove a pump for inspection, we find there is notably less damage from abrasion in the Peerless equipment."

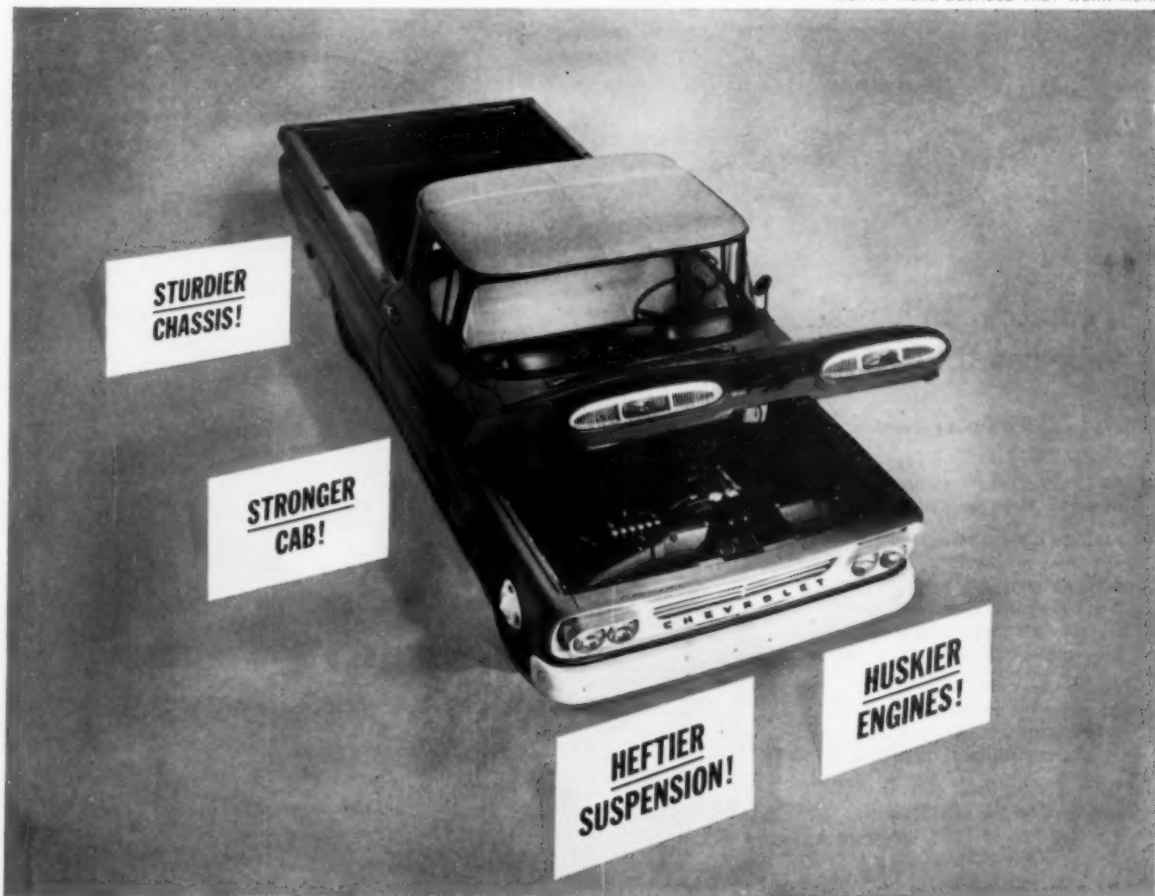


▲ In addition to the deep well turbine pumps, Peerless Type A booster pumps are in use at four stations. Capacities are approximately 1000-1200 gpm against heads of 170-180 feet.



Standardize on Peerless pumps for all your water supply and pumping needs. Like the Waukesha Utility, you'll find Peerless pumps last longer, cost less to maintain and do the job better. For full details on Peerless pumps for your application, write us or clip coupon below.

<p>Putting Ideas to Work</p> <p>Peerless Pump</p> <p>HYDRODYNAMICS DIVISION</p>	<p>Offices:</p> <p>New York; Detroit; Cleveland; Chicago; Indianapolis; St. Louis; San Francisco; Atlanta; Plainview; Lubbock; Phoenix; Albuquerque; Los Angeles; Fresno.</p> <p>Distributors in principal cities.</p> <p>Consult your telephone directory.</p>	<p>Peerless Pump, Hydrodynamics Division, Food Machinery & Chem. Corp. 301 West Avenue 26, Los Angeles 31, California</p> <p>Please send me Bulletins B-141 and B-1300 on Peerless Deepwell and Type A pumps.</p> <p>Name _____</p> <p>Address _____</p> <p>City _____ State _____</p>
--	---	--



CHEVY'S PUT TOGETHER TO STAY TOGETHER ...TO CLAMP DOWN ON COSTS!

Here are the strongest truck components known... assembled lastingly, with care and craftsmanship. It's Chevy's way of making sure you get maximum truck life; extra assurance of higher profits because of far fewer maintenance and repair charges.

NEW STRONGER CAB CONSTRUCTION. New steel braces reinforce cab underbody, help keep cab tight and solid. Husky new box-section pillars frame door openings, keep doors in lasting alignment. New roof panel is double walled for extra strength.

NEW STURDIER CHASSIS COMPONENTS. New stronger frames with rigid box-section rail design increase torsional stiffness up to 1100%! And *brakes* are bigger for longer brake life and safer stopping. Bigger capacity *axles* and *suspensions* boost load-carrying ability.

TRUCK-BUILT V8's AND 6's. Components such as brawny forged steel crankshafts, long-lasting precision bearings and oil bath air cleaners provide sure dependability that keeps your maintenance costs *down*.

NEW HEFTIER SUSPENSION smooths the ride; protects everything from wear and tear. Independently suspended front wheels, rigid control arms and strong torsion bar springs take tough runs with strength to spare.

■ Chevrolet's building 'em *tough* these days, even tougher than ever before. And that's saying something when you consider how Chevrolet trucks have stood up over the years. Here's a typical example:

101,000 miles on a truck-busting job—and still going strong! The strength and stamina of this Chevy pickup has paid off handsomely for the Mitchell Insecticide Company, Inc., of Fairfax, S.C. In rugged service, hauling maximum loads of nitrogen throughout the southeastern states, this Chevy has logged 101,000 miles with no mechanical trouble at all.



That kind of performance has been Chevy's stock-in-trade for years; and the '60's are designed to put out even more of it. See your dealer for all the details. . . . Chevrolet Division of General Motors, Detroit 2, Mich.

1960 CHEVROLET STURDI-BILT TRUCKS



a giant needn't speak
to be heard...

... he need only be a giant.

*he need only do the things
that only a giant can do ...
and he will be listened to.*

*we have a giant of our own.
his name is diesel.
he is an engine—
a supplier and creator of power.
his jobs are many and varied,
his demands are infrequent and few.*

*in an emergency
he can work on almost any fuel.
on assignment
he can work almost anywhere at all.*

*he makes the boats go ...
towboats on the Mississippi,
harbor boats in Pakistan,
fishing fleets out of Portugal,
tuna clippers off Peru.
in wartime he drove submarines
and landing craft.
today he helps atomic vessels
do their job.*

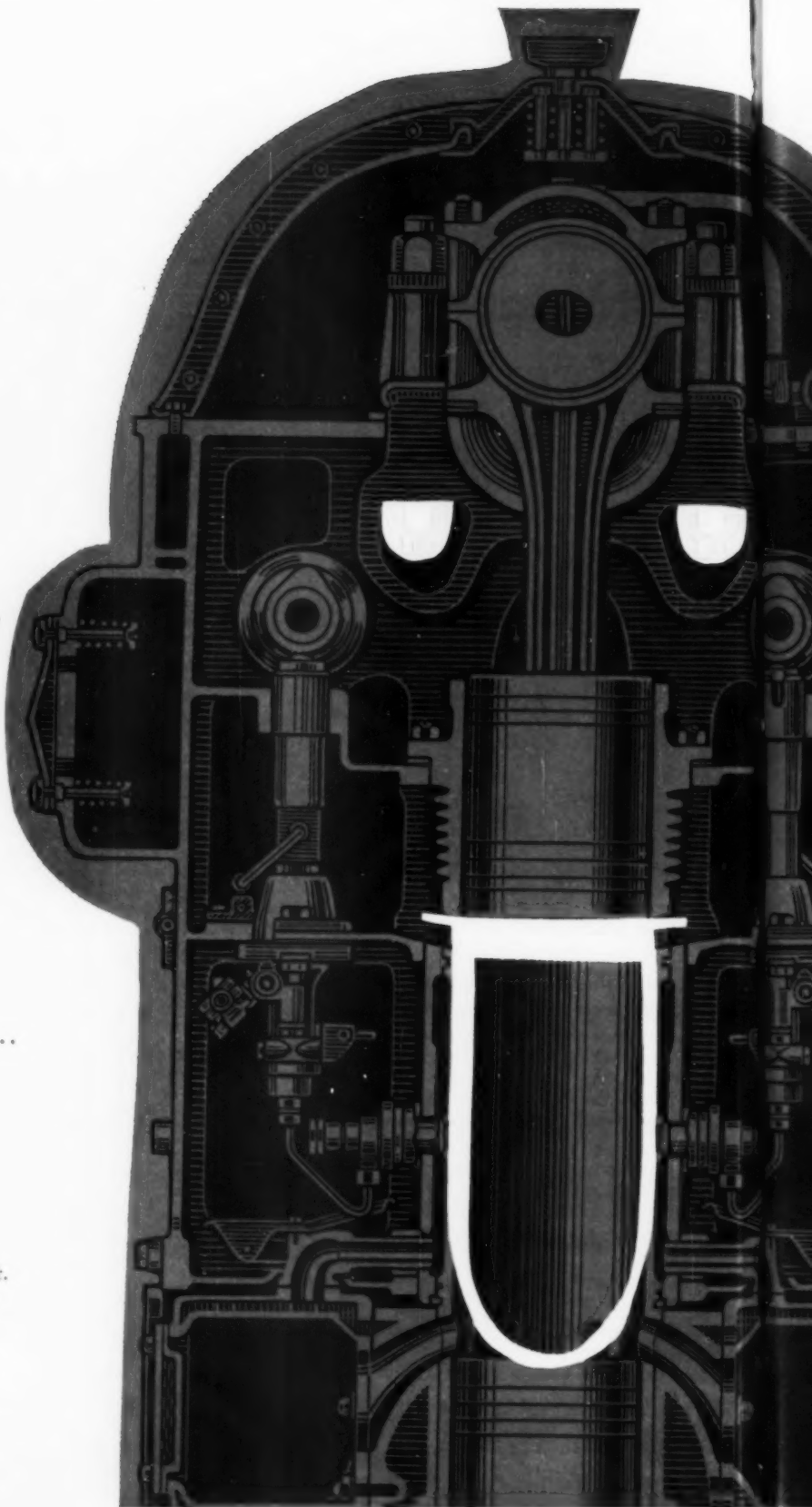
*he drives ...
cement mills in Indonesia,
dredges in Manila Bay,
oil drills in Venezuela,
rigs in the Gulf of Mexico.
he pulls buses, trucks and tractors ...
locomotives, rock-crushers
and bulldozers.*

*he generates ...
light for cities
and power for plants,
electricity for homes
and more for hospitals.
he powers
missile stations in Wyoming,
radio stations in Sudan
and emergency stations in New York.*

*there is no country in the free world
where he is a stranger.*

*there is nothing he will not tackle
and little he cannot do.*

** his roice is in his accomplishments
and you hear it every day.*





From Beloit to Bangkok—Fairbanks-Morse diesels are known, respected and relied on. They can be tailored to available fuel. They handle heavy loads in short periods of time. And they provide low-cost electricity for almost every situation you can think of. Their minimum weight, lack of vibration and simplicity of construction are further guaranteed by our 24-hour service the world over. There is no other producer of power more universally accepted than our diesel.

If your business demands effective, dependable and economical power—you will be interested in learning more about our complete line of diesel engines.

Write to: Diesel Division, Fairbanks, Morse & Co., Beloit, Wisconsin.

Fairbanks, Morse

A MAJOR INDUSTRIAL COMPONENT OF **FAIRBANKS WHITNEY CORPORATION**

End cross-section of the
Fairbanks-Morse Opposed-Piston
diesel, Engine No. 38D8-1/8

*"First we thought we'd have to move
Uncle Bull but Tyton lays so easy
he ain't even stirred."*



U.S.
cast iron
PIPE

FOR WATER, SEWERAGE AND

no fuss, no muss, no cuss!

Fact! Not a worry in a workload with Tyton Joint® pipe. This easy-going pipe is so easy to assemble . . . lays so fast your ditcher has to step on it to keep ahead.

Tyton® is so simple. Only one accessory needed. No bell holes. No caulking equipment. No nuts or bolts to fasten. Minimizes weather worries too. You can lay Tyton in rain or wet trench. That means more working days, more production, lower installation cost.

Get the facts on time, money, trouble-saving Tyton Joint pipe. You'll sell yourself. Call or write today.

U.S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A Wholly Integrated Producer from Mines
and Blast Furnaces to Finished Pipe.

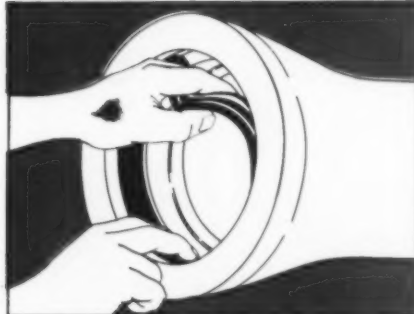


INDUSTRIAL SERVICE

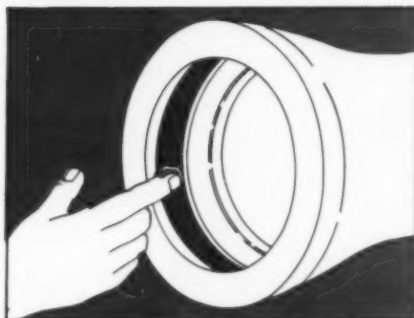
CAST IRON

TYTON®

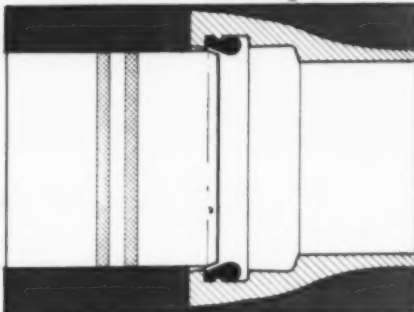
ONLY FOUR SIMPLE ACTIONS



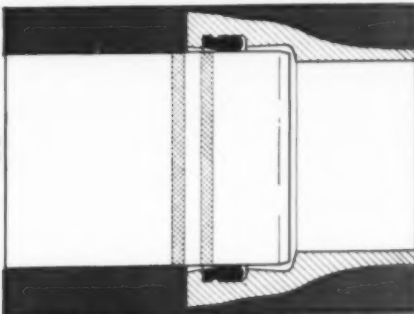
Insert gasket with groove over bead in gasket seat . . . a simple hand operation.



Wipe film of Tyton Joint® lubricant over inside of gasket. Your receiving pipe is ready.

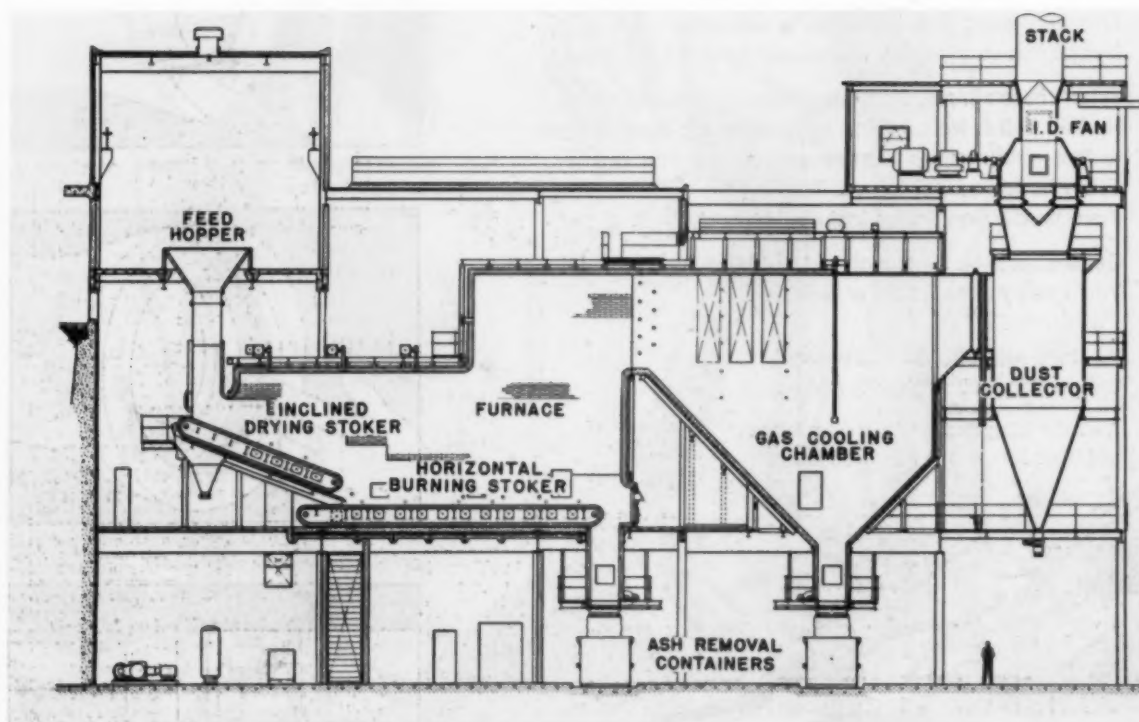


Insert plain end of entering pipe until it touches gasket. Note two painted stripes on end.



Push entering pipe until the first painted stripe disappears and the second stripe is approximately flush with bell face. The joint is sealed . . . bottle-tight, permanently! The job's done . . . fast, efficiently, economically. Could anything be simpler?

Refuse disposal plant in emphasizes economy



*Recent tests prove
that C-E Incinerator Stokers
are perfect for the job*

Philadelphia's ultra-modern Northwest Incinerator Plant — recently placed in service — contains two C-E Incinerator Stoker units designed to burn 600 tons of refuse daily. "Continuous processing" — inherent in C-E Traveling Grate Stokers — enables the entire operation to be automatic, efficient, quick and clean.

Extensive tests at the Northwest plant have shown the ability of the C-E units to operate efficiently through a wide load-and-overload range, and to reduce all refuse to a sterile ash free from unburned materials and bothersome odors.

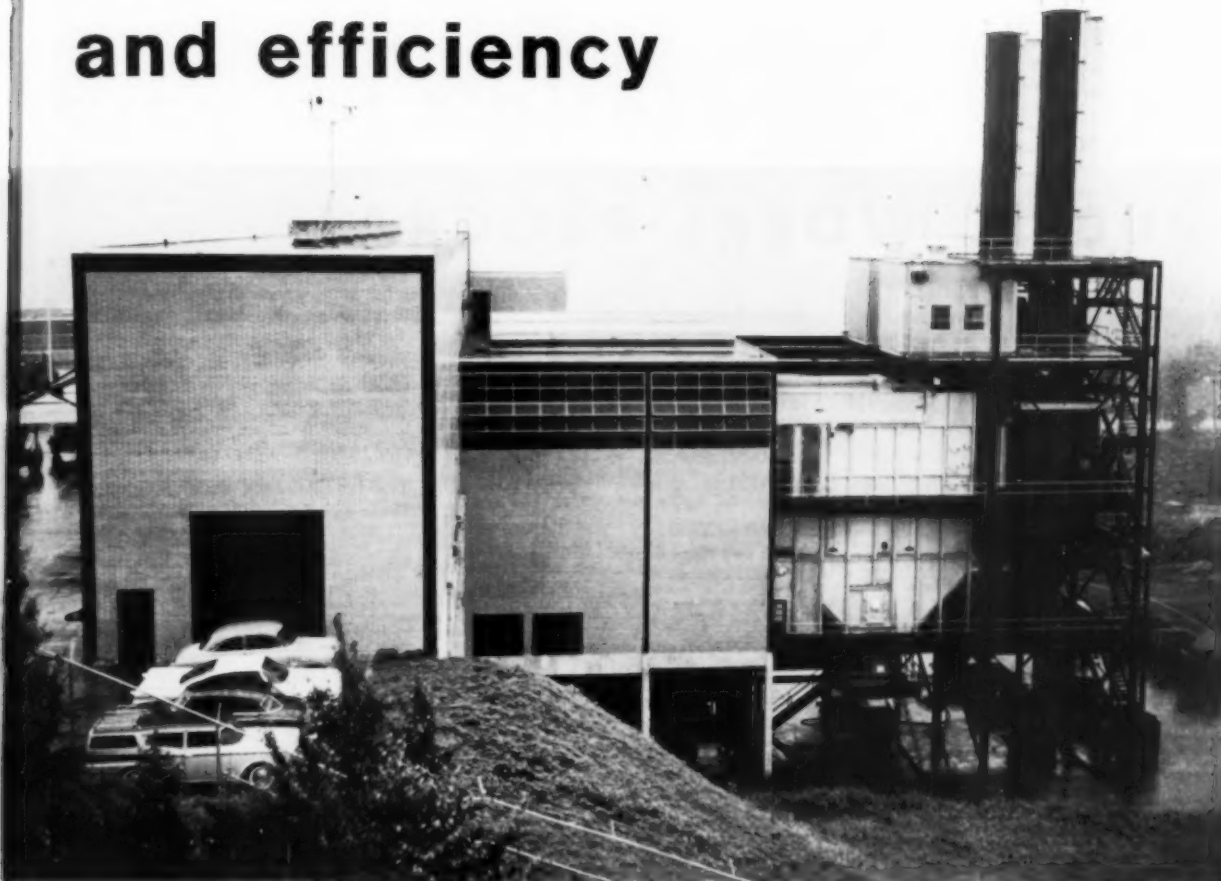
These results indicate that the selection of Combustion Incinerator Stokers is simply a matter of both sound engineering and sound economics. Every C-E

system now in operation has service-proved its labor saving and reliability attributes. From the time the refuse is deposited into the self-sealing, non-clogging hopper, until the incinerated residue is hauled away, only minimum operating attention is required.

The residue, as it is discharged from the C-E Incinerator Stoker, provides a sanitary, inoffensive fill for the reclamation of waste land. If desired, a Waste Heat Boiler may be added to the system to provide steam for power or process.

You and your consultants are invited to contact your nearest C-E office for more information about using the C-E Incinerator Stoker as a solution to your refuse disposal problem.

Philadelphia and efficiency



The Northwest Incinerator Plant. A cross-sectional view (from the same vantage point) is shown on the opposite page. Day & Zimmerman, Inc., Consulting Engineers. Carroll, Grisdale and Van Alen, Associate Architects. Tynan Incinerator Co., Incinerator Contractor. David M. Smallwood, Commissioner; Abraham Michaels, Deputy Commissioner and Chief Sanitation Engineer, Department of Streets, City of Philadelphia.

HIGHLIGHTS OF C-E DESIGN

- Requires less labor than any other burning method.
- Easy to operate—no heavy stoking or cleaning of fires.
- Assures maximum availability.
- Large hopper and chute provide sealed, continuous supply of refuse.
- Continuous, automatic burning of fuel on grate from front to rear.
- Zone control of air to fuel bed assures maximum combustion efficiency.
- Ratio of overfire and undergrate air easily controlled by use of dampers.
- Continuous discharge of residue from moving grate surface.
- Easily replaceable grate elements.
- Special heat-resisting iron—most suitable material—used for grate surface.
- Wide keys over driving chains prevent fouling.
- Steel driving chains, below grate and removed from heat, take all tension.
- Take-up mechanism easily accessible at front.
- Applicable to largest incinerators.
- Provides most economical method of disposal.

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

Canada: Combustion Engineering-Superheater Ltd.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

C-288

Equipment and Materials for your PUBLIC WORKS PROGRAM

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

NEW LISTINGS

Vitrified Clay Pipe

That Joins Like Magic

171. Clay pipe with new "Presto-Seal" joints has spigot and socket ends of factory-moulded polyester, with a permanently embedded rubber compression gasket, a combination that gives a permanent, flexible seal in seconds. For illustrated literature on joint details, installation and performance get Bulletin PS-101 from Kaul Clay Company, P. O. Box 628, Toronto, Ohio.

A Comprehensive Handbook on Water Meter Settings

174. "The Engineering of Water Meter Settings" contains 34 pages of clearly illustrated data and specifications to help improve your practices and simplify your work. Every Water Department should have a copy of this valuable reference book. To get yours address Ford Meter Box Co., Inc., Wabash, Indiana, or use the inquiry card.

Package Sewage Plants for 50—5000 Population

181. Design information on Walker "Spar-jair" package sewage treatment plants for sizes from 50 to 5000 population equivalent is presented in a 12-page bulletin, No. 19-S-94. Typical plans and sections, special design considerations, specifications and a discussion of the "how" and "why" of the contact stabilization process are included. Check the inquiry card or write Walker Process Equipment, Inc., 840 No. Russell, Aurora, Ill.

New Concept of Tank Form For Large-Volume Water Storage

187. Functional in design, low in cost and large in capacity, the Graver Cylindroid offers a new approach in ground-level water storage. Square plan of the Cylindroid makes full use of ground area while low height makes it easy to screen with trees and landscaping. Investigate these and other advantages set forth in a new brochure of Graver Tank & Mfg. Co., 4809 Tod Ave., East Chicago, Indiana. Use the handy inquiry card.

Factory-Built Pneumatic Sewage Lift Stations

191. Design features and operational characteristics of the Smith & Loveless factory-built "Du-O-Ject," a duplex pneumatic ejector sewage lift station made in 30 to 200 gpm capacities, are presented in four-color, 6-page Bulletin 616-A. Included is a fold-out drawing which points out every major feature of mechanical and electrical equipment. Write Smith & Loveless, Box 8884, Kansas City 15, Mo., or use the reply card.

Heavy Jobs or Light Jobs—

Ford Tractors Will Fit

203. The versatility of Ford tractors and equipment for construction is given new emphasis by the handsome new four-color, 16-page booklet that shows Ford loaders, backhoes, dozers and grading equipment in use with Ford tractors. Heavy and light loading and excavating for a variety of municipal jobs are specially featured. Get Booklet AD-8250 from Tractor and Implement Div., Ford Motor Co., 2500 E. Maple Road, Birmingham, Mich., by checking the inquiry card.

A Reference on

Truck and Floor Cranes

208. Conveniently assembled in a new folder, details on a complete line of truck-mounted and floor model cranes make a handy reference. Geared and hydraulic types with fixed or extension booms plus hand-winch specifications are included in Catalog W-102 of H. S. Watson Co., 1316 67th St., Emeryville 8, Calif. Check the reply card.

Air Pollution Questions

Have You in a Fog?

221. Field tests may be the answer. Using the air pollution field test apparatus of Central Scientific Co., 1700 W. Irving Park Rd., Chicago 13, Ill., on-the-spot surveys of 18 major pollutants may be made in 90 minutes by unskilled personnel. Analysis is reliable and inexpensive. Full details in comprehensive Bulletin 313. Check the inquiry card for your copy.

Low Cost Equipment

for Soil Sampling and Coring

228. A well-illustrated broadside showing the latest in economical equipment for shallow hole boring and sampling is available from The Giddings Machine Co., Box 406, Fort Collins, Colo. Use the inquiry card for full information.

Manual Reviews

Waste Treatment Processes

242. A process-by-process review of modern waste treatment methods and equipment is provided in an informative 20-page general manual issued by American Well Works, 100 No. Broadway, Aurora, Illinois. Write direct or use the handy inquiry card to get your copy of Manual 160.

Cut Labor and Cost of

Replacing Sweeper Brooms

259. Here's a revolution that is as simple as putting a nut on a bolt. For the full RADAX story of no cores to buy, no changes in present equipment, far fewer man-hours to pay for, address Rynal Corp., 114 St. Joseph St., Arcadia, Calif., or check the reply card.

How Vertical Sand Drains Work

260. . . is described in Bulletin 71 with section views of typical installations and a brief history of commercial use since their origination and development by O. J. Porter. Write to Pile Hammer Division, McKiernan-Terry Corporation, Dover, New Jersey.

Stock Storage Problems

Are Made Easier

244. Arrangement of orderly storage of supplies and parts needed by public works administrative and shop departments is made easier with complete data on standard shelving parts. Information on shelving for every purpose is contained in 36-page Catalog 2400 of Penco Div., Alan Wood Steel Co., 200 Brower Ave., Oaks, Pa. Check the reply card.

To Meet Increasing Water Demands, These Two Steps Will Help

247. Two new products designed to help meet constantly increasing demands for water are described in a folder of Hersey-Sparling Meter Co., 250 Elm St., Deham, Mass. These are a flow analyzer that provides strip chart rate of flow and volume records, and a two-rate register that can be substituted for the flow analyzer. Get this data by checking our reply card.

Specifier's Guide

For Mercury-Lamp Ballasts



173. A 10-page publication that discusses the selection and application of mercury-lamp ballasts, both indoor and special purpose weather-proof and high temperature units, has been made available by General Electric Co., Schenectady 5, N. Y. For your copy of GEA 7056, check the inquiry card or write direct.

Compact Trencher Thrives

On City Work

246. Problem trenching locations in city and suburban work where obstructions prevail are neatly solved by the Cleveland Model 92 "Baby Digger," a small, compact, tough trencher. Full description, specifications and many photos in Bulletin L-108 give the full story. Write Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Insect Control and Soil

Stabilization with One Unit?

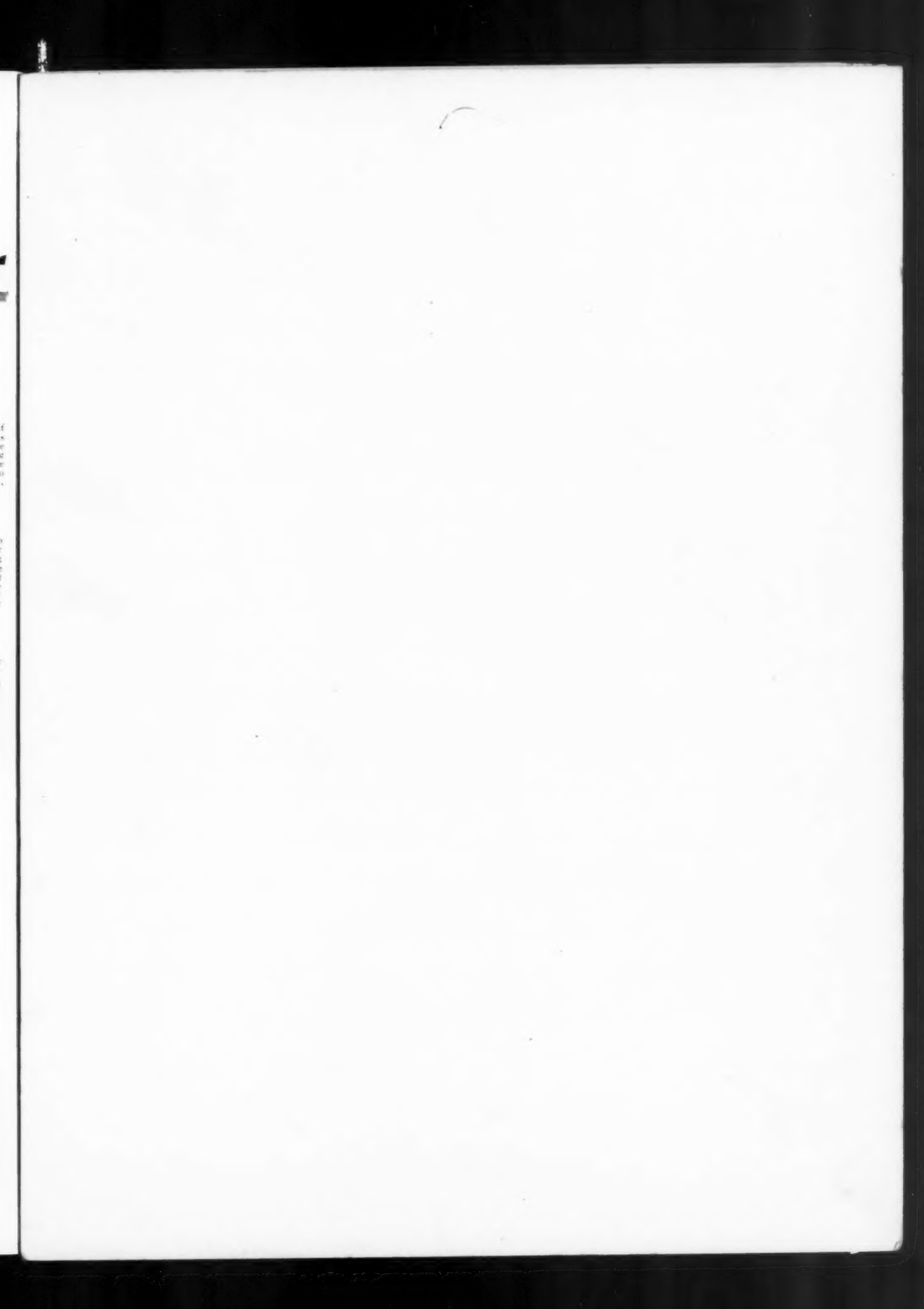
250. Yes, if it's a Buffalo Turbine sprayer-duster that is used for dry or wet insecticides and finds application also in sand, dust and soil stabilization with lignin sulfonate. Several popular models, trailer or skid mounted, are described in literature of Buffalo Turbine Agricultural Equipment Co., Inc., Gowanda, N. Y. Check reply card for your copies.

USE THIS CARD to get detailed information on products and services mentioned in this issue. Circle numbers below and mail today.

Circle numbers from page 20 to 29	Circle numbers from page 30 to 39
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99	100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199

Name (Print Name) _____
 Company _____
 Address _____
 City _____ State _____ Zip _____
 Date _____

USE THIS CARD NOW





"I think the lake intake needs checking!"

**Better check your literature files, too.
Replace the obsolete and catch up on the new**

**By using the system below to get helpful catalogs
and information that will bring you up to date**

- Each item has a number
- Select the ones of value to you
- Circle the numbers, sign and mail
- No postage is needed

USE THIS CARD to get detailed information

August 1960

Please send me literature on the following items described in PUBLIC WORKS:

Readers' Service Booklets Appear on Pages 34 to 54

20	21	23	26	31	42	43	50	51	55	57	64	66	70	73	76	78	80
93	95	102	109	116	117	120	128	131	137	150	152	153	154	155	159	160	161
162	164	166	167	171	173	174	180	181	183	187	188	190	191	194	201	202	203
207	208	210	217	219	221	222	228	237	240	242	244	246	247	248	250	251	254
258	259	260	266	272	273	282	285	287	289	293	294	297	299	302	304	305	307
311	315	319	320	327	328	329	330	334	335	336	338	341	342	343	344	345	346
347	357	360	362	363	365	367	368	371	379	380	385	390	397	400	408	409	432
436	438	439	446	479	483	492	495	500	505	510	520	523	524	525	535	537	539
550	554	555	568	571	586	610	616	632	640	646	654	656	657	662	665	681	682
688	692	694	695	698													

New Equipment Items Appear on Pages 222 to 227

8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	8-10	8-11	8-12	8-13	8-14	8-15
8-16	8-17	8-18	8-19	8-20	8-21	8-22	8-23	8-24	8-25	8-26	8-27	8-28	8-29	8-30

Name (Please Print) _____

Occupation _____

Street _____

City _____ State _____

NOT GOOD AFTER SEPT. 15, 1960

**For prompt
results, mail
this card
today.**

Meetings and Conventions

Urban Public Health and Residential Environment Seminar

Southern Illinois University, Carbondale, Ill., Aug. 8-12. Apply to Chief, Training Branch, Communicable Disease Center, 50 Seventh St., N.E., Atlanta 23, Ga.

Pennsylvania Sewage and Industrial Wastes Assoc.

Pennsylvania State University, University Park, Pa., Aug. 10-12. Sec.-Treas., J. R. Harvey, 996 So. Main St., Meadville, Pa.

National Association of County Officials

Hotel Fontainebleau, Miami Beach, Fla., Aug. 14-17. Exec. Dir., Bernard F. Hillenbrand, 1001 Connecticut Ave., N.W., Washington 6, D. C.

American Public Works Assoc.

Manhattan Hotel and The Coliseum, New York, N. Y., Aug. 14-17. Exec. Dir., Robert D. Bugher, 1313 E. 60 St., Chicago 37, Ill.

Robert A. Taft Sanitary Engineering Center Courses and Seminars:

Aug. 15-19, "Recent Developments in Water Bacteriology";
Aug. 23-25, "Water Quality Data Collection and Utilization";
Aug. 29-31, "Water Quality Measurement and Instrumentation."

American Water Works Assoc.

So. Dak. Sec and So. Dak. Water & Sewage Works Conference, Grand Hotel, Watertown, So. Dak., Sept. 7-9.

Institute of Traffic Engineers

Edgewater Beach Hotel, Chicago, Ill., Sept. 12-15. Exec. Sec., David M. Baldwin, 2029 K St., N.W., Washington 6, D. C.

American Water Works Assoc.

New York Sec., Saranac Inn, Saranac Inn, N. Y., Sept. 14-16. Sec.-Treas., Kimball Blanchard, c/o Neptune Meter Co., 22-22 Jackson Ave., Long Island City, N. Y.

American Water Works Assoc.

Virginia Sec., Cavalier Hotel, Virginia Beach, Va., Sept. 14-16. Sec., Edward H. Ruehl, R. Stuart Royer & Assoc., 15 W. Cary St., Richmond, Va.

New England Water Works Assoc.

Northern New England meeting, Queen Elizabeth Hotel, Montreal, Quebec, Canada, Sept. 18-22. Sec., Joseph C. Knox, 73 Tremont St., Boston 8, Mass.

National Conference for County Engineers and Officials

Annual Meeting, Biltmore Hotel, Atlanta, Ga., Sept. 19-21. Dir., Ben F. Ostergren, County Div., ARBA, 600 World Center Bldg., Washington 6, D. C.

Water Pollution Control Federation

(Formerly the Federation of Sewage & Industrial Wastes Assoc.)

The Trade & Convention Center, Philadelphia, Pa., Oct. 2-6. Exec. Sec., Ralph E. Fuhrman, 4435 Wisconsin Ave., N.W., Washington 16, D. C.

19th Annual Short Course on Roadside Development

State Office Bldg., Columbus, Ohio, Oct. 4-7. Wilbur J. Garmhausen, State of Ohio, Dept. of Highways, Columbus 15, Ohio

American Society of Civil Engineers

Hotel Statler, Boston, Mass., Oct. 10-14. Exec. Sec., W. H. Wisely, 33 W. 39th St., New York 17, N. Y.

American Water Works Assoc.

California Sec., Lafayette Hotel, Long Beach, Calif., Sec., Oct. 24-27. F. F. Watters, Hydr. Engr., State Bldg., Civic Center, San Francisco 2, Calif.

American Public Health Assoc.

Civic Auditorium, San Francisco, Calif. Oct. 31-Nov. 4. Exec. Dir., Dr. Berwyn F. Mattison, 1790 Broadway, N. Y. 19, N. Y.

American Association of State Highway Officials - 1960 Convention

Nov. 27-Dec. 2, Detroit, Mich. Write A. E. Johnson, 917 National Press Bldg., Washington 4, D. C.

American Road Builders' Assoc.

Chalfonte-Haddon Hall, Atlantic City, N. J. Mar. 5-8, 1961. Vice Pres., Louis W. Prentiss, 600 World Center Bldg., Washington 6, D. C.

BUSINESS REPLY CARD

No Postage Stamp Necessary if Mailed in the United States

PUBLIC WORKS Publications

200 South Broad Street

Ridgewood, New Jersey

Readers' Service Dept.

FIRST CLASS

PERMIT No. 7

RIDGEWOOD, N. J.

PAYLOADER[®]

with 4-in-1 bucket



Handles many jobs for City of Jacksonville

The City of Jacksonville, Fla., has three "PAYLOADER" tractor-shovels in its Sewer and Drainage Dept. The newest is this Model H-70 equipped with Drott 4-in-1 bucket. How useful and indispensable this combination can be in any city's equipment pool was demonstrated on this project.

The job involved relocation of 700 feet of 15" terra cotta sewer in preparation for a new expressway. The "PAYLOADER" with its multiple-action bucket grasped and loaded out large chunks of concrete pavement, curbing and sidewalks, loaded out excess material, pulled sheet piling, backfilled the trench, and handled many other chores all over the job.

When you buy a "PAYLOADER" you get more than a tractor-shovel. You get the most *proven* and the most *useable* of machines because of the most complete and unusual selection of attachments ever made available for any tractor-shovel.

The 4-in-1 bucket, front or rear-mounted back-hoe, bituminous spreader, side-boom, pick-up street sweeper, leaf-loader, rotary, "V" and blade snow plows are all available to make your "PAYLOADER" a one-machine equipment pool. And there's a proven "PAYLOADER" type and size for any size municipality.

HOUGH[®]



THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY



HOUGH, PAYLOADER, PAYMOVER, PAYLOGGER and PAY are registered trademark names of The Frank G. Hough Co., Libertyville, Ill.

The Powerful hydraulic clam action of the 4-in-1 bucket quickly grasps, moves and loads large, awkward pieces of old concrete.

With clam lip raised, the "PAYLOADER" becomes an efficient bulldozer.



THE FRANK G. HOUGH CO.

761 Sunnyside Ave., Libertyville, Ill.

☐ Send bulletin "more mileage for your tax dollar"

Name _____

Title _____

Gov't Unit _____

Street _____

City _____

State _____

8-9-3

To order these helpful booklets check the reply card opposite page 34.

NEW LISTINGS (Cont.)

Comprehensive Catalog Helps You Select A. C. Motors

272. A new 56-page Catalog No. 200 includes pricing and dimensional data on multi-shielded motors ranging from $\frac{1}{8}$ to 200 hp. Useful section deals with motor selection and application. Address Sterling Electric Motors, Inc., 5401 Telegraph Road, Los Angeles 22, California, or check the reply card.

Be Informed on Forming

282. Forming applications, tie spacings, typical panel layouts, corner details, stripping procedures and radius wall forming are diagrammed and discussed in bulletin, AIA File 4-D-3. Get yours by writing to Gates & Sons, Inc., 80 So. Galapago Street, Denver 23, Colorado, or send us the reply card.

You Can Take Your Electric Power With You

297. . . . with this compact mobile AC generator mounted in your vehicle. Fan-belt type drive fits trucks or tractors. Get full data on this power source for lights, hand tools, water pumps, test line equipment, hoists and many other requirements. Address Generac Sales, Inc., Wales, Wisconsin.

Sewer Protection By Coating

320. . . . is described in the bulletin giving detailed specifications and application procedures for Corotar, an epoxy-resin and coal tar pitch combination which can be applied like paint to metal or concrete. Learn more from Cook's Paints, Box 389, Kansas City 41, Missouri, or circle the reply card.

Don't Dig—Auger

328. Modern earth augers and their applications in installations under lawns, streets, highways, walks, buildings, etc. are discussed in this bulletin, A1-10M-2-60. Write to Modern Products, Inc., Exeter, Nebraska.

Vest Pocket Guide to Better Welds

285. This 80-page pocket-sized booklet, EW-213, will be a boon to every shop where practical information on proper welding procedures is needed. Discussed are the five essentials for good weldings, operator qualifications, welding positions, metal identification, welding symbols, definitions of terms, electrode selection and a wealth of other practical data. Send for a copy by writing to Hobart Brothers Co., Troy, Ohio, or check the reply card.

Refuse Body Reference

287. For residential and commercial refuse collections the Ram Pak bodies described in bulletin, Form No. A-433-A, provide a crew ramp, telescoping hoists, ram and blade, and watertight construction. Write Baughman Manufacturing Co., Inc., Jerseyville, Illinois.

Chemical Or Sand Spreader Specs

329. . . . are discussed in the bulletin on the Chippewa tailgate spreader offering speed and spread control, even pattern, easy attachment and adaptability to many materials. Write to George Malverne & Co., Inc., Box 295, Hicksville, New York.

Submersible Pumps For Municipal Use

341. A new 12-page bulletin that describes the line of BJ submersible pumps is available from Byron Jackson Pump Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. Construction and operation of the pumps are covered along with a handy selection chart that gives capacity and head performance.

Hydraulic Cutter Will Cut Water Pipe

346. Water pipe through 12 ins. can be easily cut with this Wheeler cutter. Check the reply card or write The Wheeler Mfg. Corp., P. O. Box 688, Ashtabula, Ohio, for models and specifications.

Manual On Procedures For Sub-Surface Soils Inventory

319. Details for using the Barnes Layer Method of sub-soil surveying to determine an exact inventory of sub-soils by quantity, quality and location. Highway engineers, geologists and others have found this method saves expensive test borings in many instances. Find out by writing to Associated Research, Inc. 3777 W. Belmont Avenue, Chicago 18, Illinois, or return the reply card.

Send Your Equipment To The Cleaners

334. . . . with the 3 types of steam cleaners listed along with specifications in the bulletin, Form SC-4C. For the full story on gas or oil fired, stationary or portable units to fit every job write to Malsbary Manufacturing Co., 845 92nd Ave., Oakland 3, California, or circle the reply card number above.

Power-Controlled Motor Graders

338. Three models of motor graders with torque converters and power shift transmissions are described in detail in bulletins, No. HWG-521 and HWG-508 available from the Huber-Warco Co., Marion, Ohio, or by circling the reply card number above.

Perneme Filament For Sweeper Brooms

347. Synthetic brush filament that can give 4 times as many sweeping miles in street sweeper brooms is covered in information from O. Cedar Industrial Products, Div. of American-Marietta Co., 2246 W. 49th St., Chicago, Ill.

Simplify Sewage Plant Design with Couplings

360. How to use style 38 Dresser couplings to the best advantage in sewage treatment plant design are illustrated with typical piping diagrams and size and specification tables in 18-page bulletin. Check the reply card or write the Dresser Mfg. Div., Bradford, Pa.

cost

...based on performance...

...begins with a st



Bulletin on Submersible Booster Pump

357. Typical installations, description of unit, standard models, selection tables and the many jobs where this pump can be used are fully described in the bulletin. For full details write Layne & Bowler Pump Co., 2943 Vail Ave., Los Angeles 22, Calif., or check the handy reply card today.

Fertilizer Distributor for Parks and Roadsides

362. Uniform spreading, even on rough ground, and simplified maintenance that assures long, economical use are features of the Lely fertilizer distributor. Colorful brochure giving full details is available from Lely Ltd., 2113 Paisley Ave., Burlington, Ontario. Check reply card for your copy.

Have You Investigated Steel Cord Tires?

363. Michelin steel cord truck tires, including the new earthmover and sand tire type, offer unusual dependability under difficult conditions. Steel cord tires have been widely used for refuse collection vehicles, too. To get full information write to Michelin Tire Corp., 26-15 Brooklyn-Queens Expressway, Woodside 77, N. Y., or check the inquiry card.

Prompt Service on Sweeper Refill Fibers

367. Here's a dependable source of power sweeper refill fibers, including domestic and imported types and gutter broom wire. To get all the data write A. Steiert & Son, Inc., Hatfield, Pa., or use our reply card.

Hydraulic Controls Make Snow Plowing Easier

368. Hydraulically operated power controls may be readily installed on trucks that will plow snow this winter. Start preparing now to make winter maintenance an easier job. Get illustrated folder from Monarch Road Machinery Co., 1331 Michigan St., N.E., Grand Rapids 3, Mich. Use the inquiry card.

Complete Line of Traffic Signals and Control Equipment

380. A full line of traffic signal and control equipment is covered in the comprehensive catalog of Econolite Corp., 8900 Bellanca Ave., Los Angeles 45, Calif. Wide choice of components offers economy and flexibility to suit future requirements. For more information write direct to Econolite or use the convenient inquiry card.

How Warn Hubs Add Convenience to 4-Wheel Drive Vehicles

385. Warn locking hubs add versatility to 4-wheel drive vehicles, make it easy to shift to free-wheeling 2-wheel drive that cuts front end wear, eases handling and steering, reduces gear whine. Warn hub models fit all leading 4-wheel drive trucks. Get Form DC559-5 from Warn Mfg. Co., Inc., Riverton Box 6064-DC, Seattle 88, Wash., by checking reply card.

New Easy Method Taps Sewer Lines

390. Installation of wye connections to sewer mains is now an easy job with the Shower Tap drill and fittings. Full description and step-by-step outline of this method for making strong, watertight taps to the main sewer are contained in a new illustrated bulletin. Get your copy from Shower Tap Inc., 1019 Admiral Blvd., Kansas City, Mo. Check the inquiry card today.

BUSINESS ADMINISTRATION

Save Space By Filming Your Records

57. Microfilm your records by using the Recordak Microfilmer. Check the reply card or write Recordak Corp., 415 Madison Ave., New York 17, N. Y., for operation, use and price of this machine. Also available is literature on the Recordak Verifax Copier that makes certified copies 15 times faster than typing.

Which is best?

Seldom is a decision more critical and seldom is a choice more necessary than in selecting the proper water line to do the job. There is really only one long range measurement to follow—*performance cost.*

Performance cost is not so much considered with initial outlay as it is with the relation of performance to cost over time under varying conditions, standard as well as emergency. And When performance cost is the measure—steel water pipe is your only choice.

No other product gives you the strength, durability, carrying capacity, reliability, resiliency, and "bottle-tight" joints. Nor is any other water pipe as practical for installation and maintenance because of its ductility, adaptability and hi-beam strength.

But, within the great range of steel water pipes is the additional decision, what variety? Southern Pipe is experienced in helping you in this final important decision. Southern's line of STEELCOR products include such cement mortar lined pipe as CEMCOTE (cement coating), WRAPCOTE (asphalt wrapped), and TARCOTE (coal tar enamel wrapped), to meet your every economic and performance need. Call us for complete information.

No other western pipe producer offers our complete *packaged waterline service.*

Manufacturer of STEELCOR steel water pipe, including such lined and coated pipe as Cemcote, Wrapcote, Tarcote, Tarspun, Dipcote, and others.

Southern Pipe

DIVISION OF U. S. INDUSTRIES, INC.
P. O. Box C, Azusa, California • CU 3-7111 • ED 7-1221
P. O. Box 1323, Honolulu, Hawaii • Phone 28-5757

**CEMCOTE—cement mortar lined & coated
steel water pipe**

**TARCOTE—cement mortar lined & coal tar enamel
wrapped steel water pipe**

**TARSPUN—coal tar enamel lined & wrapped
steel water pipe**

steelcor decision

**WRAPCOTE—cement mortar lined & asphalt
wrapped steel water pipe**

To order these helpful booklets check the reply card opposite page 34.

WATER WORKS

Wherever Water Flows, Steel Pipes It Best

26. Brochures covering steel Pipe meeting the essential requirements for a water pipe line are available from Steel Plate Fabricators Association, 105 West Madison St., Chicago 2, Ill. Check the reply card today.

To Avoid Paint and Coatings Errors

50. First consult "A Catechism on Categories of Corrosion," a pocket sized brochure that enables you to share the expert knowledge of Hercules Powder Co., Cellulose Products Dept., Wilmington 99, Del. Finding out is free; not knowing could be costly.

Catalog on Synchronous Motors and Controls

64. A 27-page Catalog B-7292 on synchronous motors and controls is well illustrated and contains motor selector charts, application data, and formulas for calculating power factor. For a copy write Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa., or check the reply card.

Stop Swimming Pool Joint Leaks

66. Once in place, these synthetic rubber sealing compounds never let go again. Simple to apply. Write now for "Seal Pool Joints" folder and list of suppliers to Thikol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J., or circle our card number.

Easily Cleaned Long Run Filter Bed Media

70. Bulletins on Anthrafil tell the reasons why selected, graded crushed anthracite is superior to sand as a filtering material. Have you made a full investigation? Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co., Independence Sq., Philadelphia 3, Pa., presents specifications for "Sand-Soun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews and R. D. Wood fire hydrant and R. D. Wood gate valves.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Get the Real Story on Plastic Pipe

116. Available at last in new 36 page handbook for engineers, filled with pertinent information on the use of KRALOY PVC plastic pipe, fittings and valves, with a wealth of collateral data that you will welcome. To get it free, address Kraloy Plastic Pipe Co., 402 West Central Ave., Santa Ana, Calif., or use our card herein.

Guide Book Information for Emergency Power

153. This book covers what to do when commercial power fails in a fire, flood, hurricane, war and other national disasters. Check the reply card or write Caterpillar Tractor Co., Engine Div., Peoria, Ill., for a copy of "The Four Horsemen of the Space Age."

AWWA Fire Hydrants and Gate Valves

155. Above-ground maintenance Mueller AWWA improved fire hydrants and minimum maintenance Mueller AWWA non-rising stem gate valves are described in literature from Mueller Co., Decatur, Ill.

Valve and Hydrant Construction Details

161. A 72-page catalog-type bulletin, just completed, gives detailed data on construction and application of gate valves, check valves and hydrants for water works service. Write for Bulletin 5710 from Darling Valve and Mfg. Co., Williamsport, Pa., or check the reply card.

Nobody Loves Algae

164. And when you use Hyamine 2389 in your swimming pools there just aren't any algae to love. How and why this algicide works is fully described in a 12-page booklet, to be had from Rohm & Haas Co., Agricultural and Sanitary Chemicals Dept., Washington Square, Philadelphia 5, Pa. Just check the reply card.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking reply card.

Clamps for Pipe and Hose and Steel Straps

219. Literature is available from Marman Div. Aeroquip Corp., Industrial Sales Div., 1214 Exposition Blvd., Los Angeles, Calif., on clamps to stop leaks on low and high pressure pipe, band clamps for hose, duct, pipe strap hanger and mounting bracket and stainless steel flange for identification purposes. Check the reply card.

Outline of Modern

Water Treatment Equipment

248. Bulletin 4432 is recommended for engineers who need a basic refresher course on treatment of municipal and industrial water. It lists water impurities and methods of treatment and illustrates treatment systems and equipment. Check the reply card or write The Permutit Co., a Division of Pfaunder-Permutit Inc., 50 West 44th St., New York 36, N. Y., for your copy.

RADAX®

NO CORES TO BUY!



filled with long wearing water repellent
SR Plastic Filament or Tynex Nylon.

SEE US IN BOOTH C-30
APWA CONVENTION
NEW YORK CITY

A TRULY NEW CONCEPT IN PREFABRICATED Street Sweeper Brooms

STEP UP to long-wearing, PREFABRICATED Plastic Brooms without making a capital investment. Get the lowest broom cost per mile you have ever experienced — with a NEW BROOM that really sweeps clean.

- NO CORES TO BUY
- NO CHANGES IN PRESENT EQUIPMENT
- TRUE BALANCE AND UNIFORMITY THROUGHOUT

RADAX units are made on high-speed fully automatic machines. The cost factor is held down to an absolute minimum.

ONE—TWO—THREE and GO

1. Remove your stretchy broom cable.
2. Screw on the RADAX unit.
(Visualize the RADAX Broom Coil as a big nut and your broom core as a threaded bolt. The RADAX unit screws on like putting a nut on a bolt.)
3. Anchor coil ends (we furnish anchor fixtures) and you are ready to go!

The RADAX Unit is disposable when worn out
Nothing to return for refilling

RYNAL CORPORATION

DEPT. B, 114 ST. JOSEPH ST.
ARCADIA, CALIFORNIA • HI 6-3600



Filaments are grouped into tufts — bound in steel channel and formed into the unique continuous one-piece RADAX Coil.



Screw the RADAX Broom Coil onto the old core — anchor — it's ready to go!

SERIES ABS

"Sky-Master"

HYDRAULIC AERIAL BEAM



That's right, with the Series ABS Sky-Master workmen can reach out-of-the-way areas quickly and work on or near energized phase lines in complete safety.

Outer beam of the Series ABS is an extra-strong Spirex tube which withstands dielectric testing far in excess of normal requirements. Reinforced plastic work basket has no current-conducting parts or projections . . . provides ample work space and toe room for the operator.

Control levers beside work basket are connected to those on the mast by direct linkage, giving the operator a positive "feel" not possible with secondary hydraulic control-actuating systems.

Dielectric, reinforced plastic rods are installed in the control linkage and basket leveling mechanisms to electrically isolate the basket from the ground.

Modern way to work on energized high voltage lines

The Series ABS is fully-hydraulic in operation, powered by a pump driven by a power take-off on the truck transmission. Outer beam movement in an operating arc of 270 degrees and inner beam movement through a 110-degree arc is independently controlled. Mast can be rotated continuously in either direction. Safety devices prevent unwanted movement when controls are in neutral or if hydraulic system is damaged.

Maximum ground-to-basket floor height is 42'—enabling men to work safely and without fatigue up to 47' above ground. Wide range of operation permits spotting of the work basket in limitless positions in any direction from the truck. The Series ABS, installed on a Powers-American Body that fits your work needs, can be furnished in two models; Series ABS-1-42 having one basket, Series ABS-2-42 with two baskets.

Another reason why
UTILITIES EXPECT MORE FROM

POWERS *American*

UTILITY BODIES AND EQUIPMENT

For descriptive literature and price information write . . .

McCABE-POWERS BODY COMPANY

5900 No. Broadway
ST. LOUIS 15, MO.

625 Cedar Street
BERKELEY 10, CALIF.

1461 E. Washington Blvd.
LOS ANGELES 21, CALIF.

5525 S.E. 28th Ave.
PORTLAND 2, ORE.

To order these helpful booklets check the reply card opposite page 34.

Design of Prestressed Concrete Tanks

194. An 8-page technical Bulletin, T-19, on the Design of Prestressed Concrete Tanks, gives engineering data and formulas of general interest to anyone considering prestressed concrete for storage tanks. Check the reply card or Write to The Preload Co., Inc., 355 Lexington Ave., New York 1, N. Y.

Why Hunt All Over the Place?

201. Instead, use this 32 page cross-indexed catalog for quick easy reference equipment, trade names and applications. Covers all major equipment in the complete Inflico line. Write for Bulletin 80 to Inflico Inc., P.O. Box 5033, Tucson, Arizona.

Here's a New Note in Filter Cleaning Equipment

202. Just announced, a new S-Type Filter Arm that is reported to increase filter cleaning efficiency by 25 to 30%. Doubles the agitating impulses and improves your plant performance strikingly. Adaptable to present installations, too. Write Palmer Filter Equipment Co., Erie, Penn., or circle reply card.

U. S. Tyton Joint Pipe

210. An eight page booklet on centrifugally cast, Tyton Joint® pipe for water or other liquids is available. Tyton Joint cast iron pipe is provided with a simple, sturdy and tight slip-on type of joint. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co., Birmingham 2, Ala., or check the reply card.

Water, People and Hydrodynamics

302. . . . is the title of an illuminating booklet dealing with the world-wide problem of how to get water in adequate supply, when and where needed. Your copy can be had for the asking of Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill., or use the reply card.

Pipe Cutter for Cutting Large Size Pipe

254. An all-purpose pipe cutter that can cut pipe in or out of the ditch is described in a bulletin available from Ellis & Ford Mfg. Co., P. O. Box 308, Birmingham, Mich. Check the reply card for sizes and parts list.

Welded Steel Pipe, Steel Piling and Corrugated Metal Culvert Pipe

273. Catalog on continuous electric welded steel pipe, cement mortar lined and coated pipe, coal tar lined and wrapped pipe, water well casings and corrugated culvert pipe is available from Southern Pipe & Casing Co., A Division of U. S. Industries, Inc., P. O. Box C, Azusa, Calif. Check the reply card.

Waterworks and Municipal Castings

293. Meter boxes and covers, yokes and couplings, service boxes and manhole covers are covered in 24-page catalog. Check the reply card or write H. W. Clark Co., Mattoon, Ill., for full specifications.

When It Comes to Pumps

311. You will profit by having this 4-page condensed bulletin which illustrates and describes the Aurora Centrifugal and Apco Turbine Type Pumps with capacity ranges from 1 to 9000 GPM, and heads to 600 ft. Just write for your copy to Aurora Pump Div., The New York Air Brake Co., 630 Loucks St., Aurora, Ill., or circle number on card herewith.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 23, Wisconsin.

Technical Bulletin on Swimming Pool Filtration Equipment

335. A 24-page technical Bulletin 626, designed to help persons planning pools which must comply with local and state health regulations, is now available from the R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. Check the reply card for data on size selection charts, typical installations and drawings.

Tips for Installing Orangeburg Pipe

336. Good practice for installation of Orangeburg pipe and fittings is outlined in an illustrated four-page bulletin made available by the Orangeburg Mfg. Co., Div. of The Flintkote Co., 375 Park Avenue, New York 22, N. Y. Trenching and backfilling, pipe laying, cutting and connecting.

Mechanical Joint Tapping Sleeve and Valve

344. Smith tapping sleeve and valve answers the problem of making connections, in sizes 2 in. and larger, in water lines under pressure. Check the reply card or write The A. P. Smith Mfg. Co., East Orange, N. J., for full details.

Information on Boring Machines

365. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit are available in new bulletin just released by Earthworm Boring Machine, Inc., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included.

Electrical Equipment for Water Works

408. Whether it is motors, generators, motor-generator sets, switchgear or controls, Ideal offers performance and dependability in these vital parts of water plant operation. For details get Bulletin 305 from Ideal Electric & Manufacturing Co., 370 East First St., Mansfield, Ohio, or use the inquiry card.

- 1 First Compaction Trailer—Introduced by PAK-MOR in 1952
- 2 Introduced early 1955—Larger Trailer for Container Systems
- 3 July 1955—PAK-MOR Trailer for Transfer and Long-Haul Operations
- 4 PAK-MOR's Lo Boye arrived in 1958—Cut heavy route and medium haul costs
- 5 Handy Dump answered bulky, heavy brush and palm frond pickup problems
- 6 Handy Dump modified for combination container and route pickup service
- 7 PAK-MORs have served the Armed Forces for years across the nation



PAK-MOR Trailers have pioneered the rough road of how to cut operating costs. Refuse Collection and Disposal Problems are manifold—and so require many different answers—PAK-MOR shall continually strive toward producing equipment to do a better job!



To order these helpful booklets check the reply card opposite page 34.

What You Should Know

About Venturi Tubes and Nozzles

400. A comprehensive bulletin, No. 100, of interest to all engineers dealing with the measurement of liquid flow and its various ramifications has been issued by Simplex Valve & Meter Company, Lancaster, Pa. Data on advantages, construction and installation details, range of sizes and specifications are given in simplified form.

A New Note in

Waterworks Brass Goods

492. The Hays line covers everything from curb stops to tapping machines. Beautifully illustrated catalog is packed with information to help you buy the best. To get your copy write Hays Mfg. Co., Erie, Pa., or check the card.

Handbook on How to

Lay Concrete Pressure Pipe

524. Manual on concrete pipe laying instructions is available from Price Brothers Co., Dayton, Ohio. Check the reply card for information on how to dig the trench and handle the pipe, make the joint and the pipe bedding procedure.

Cast Iron Pipe That

Bends Under Stress

483. This cast iron pipe from 2 through 48 ins. has as advantages extra strength, high resistance to impact, bendability, greater reliability, ample wall thickness and adaptability. Check the reply card or write American Cast Iron Pipe Co., Birmingham, Ala., for full specifications.

Measure Water Accurately

In Open Ditches and Channels

694. Parshall Measuring Flumes are widely used by Irrigation Companies, Farmers, Cities and Industries. All steel construction assures accuracy within 2%. Available in sizes for 0.1 to 1340.0 cubic feet per second. Catalog B-31-C contains free-flow discharge tables, sizes, capacities and weights. Thompson Pipe & Steel Co., 3025 Larimer Street, Denver 1, Colorado will send you a free copy for the asking.

Book Tells

How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refracting Co., 300 Park Ave., New York 22, N. Y. Check the reply card.

To Insert Valves Under Pressure . . .

555. . . . let your first step be review of this "step-by-step" folder on Mueller tapping and cutting-in sleeves and valves. Write Mueller Co., Decatur, Ill., for Form W-899 or circle number on our card.

Water Filtration

Costs Can Be Reduced

692. The "Celite" system of diatomite filtration makes possible reduced installation cost, with space requirements a fraction of those for equivalent sand filtration. For informative literature write Johns-Manville, Box 14, New York 16, N.Y.

SNOW AND ICE CONTROL

Snow Plows

For Every Need

294. Frink snow plows are designed to meet snow removal needs at airports, parking lots and streets and highways. They consist of four basic types with models to fit trucks 1½ to 12 tons. For complete data write Frink Snow Plows, Inc., Clayton, N. Y.

Snow Plows For

Snow Control

539. V-type one-way and reversible plows with hydraulic hoist and having a plowing width of up to 9½ ft. are described in literature from Gledhill Road Machinery Co., Galion, Ohio. For models, specifications and features check the reply card.

Uniform Salt Spreading

Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarco Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Save on Winter

Ice Control Cost

237. . . . with the faster-working salt described in this new Bulletin B-1159S. Tella what this salt will do and why, and where to get it. Also the bonus you get from using salt for summer road stabilization projects. Address Morton Salt Co., Industrial Div., 110 N. Wacker Drive, Chicago 6, Ill., or use our card.

No Idle Trucks with these Spreaders

397. New 8-page catalog gives features, specifications, users' statements on the Fox Mountable spreaders, equally good for sand, cinders, chips, salt, calcium chloride. Designed for one-man operation and year-round use. Wide widths and high speeds. Mounts or demounts in 15 minutes. Write Fox River Tractor Co., Box 469, Appleton, Wisc., or check our card number.

Ice Control Without

Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa.

Complete Ice and Snow

Fighting Equipment

523. Snow plows in 55 models and 9 types, material spreaders with width of spread of 8 to 20 ft. and hopper capacity of 2 cu. ft., and truck grader ice blades are covered in literature from Wausau Iron Works, Wausau, Wisc.

NOW!

A Revolutionary New Approach To Transfer and Disposal of Refuse! Bigger than anything NOW in operation. Designed and planned to make Bigger Savings A Reality! A Dynamic and Bold Departure so vitally necessary today to reduce higher operating costs. . . .



PAK-MOR's Newest Trailer will be unveiled in August

SEE This New PAK-MOR Trailer at the A.P.W.A. Conference at the New York Coliseum in August. Or, if you do not plan to attend—write today for complete details!

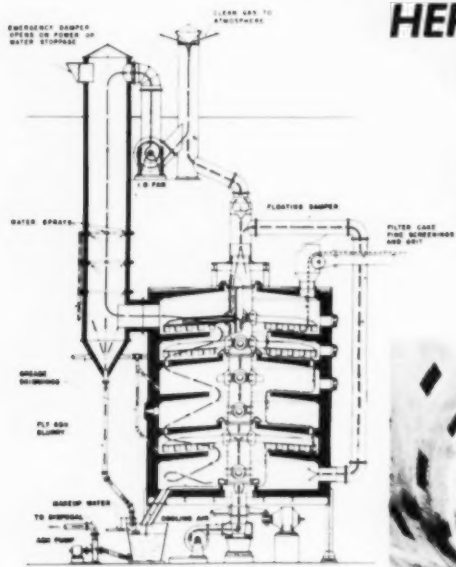


LOOP 13 & ROOSEVELT AVE. POST OFFICE BOX 14147
WA 34317 SAN ANTONIO, TEXAS

Rugged!

NICHOLS HERRESHOFF FURNACES

for
**SLUDGE, GRIT,
SCREENINGS,
and GREASE**



NICHOLS HERRESHOFF SLUDGE FURNACE
BURNING FLOW DIAGRAM



Interior view of Herreshoff showing steel shell, central shaft and refractory hearth under construction.

This rugged Herreshoff multiple hearth furnace reduces sludge, grit, grease, and screenings to sterile ash. It disposes of any or all of these materials at upwards of 1400°F safely, surely and simply.

The Nichols Herreshoff furnace provides ultimate solids disposal with years of trouble-free service.

For example, one of these furnaces performed through 7 years' continuous operation—24 hours a day—7 days a week, without a shutdown.

Another has been burning sludge since 1952 without a shutdown; over 70,000 hours.

A 20 year study at two plants shows labor and material costs for maintenance to average less than 45¢ per ton of dry solids burned.

For complete details of Nichols Herreshoff furnaces write for 24-page Bulletin 238.

And also write for our "Roto-Plug" Sludge Concentrator, Bulletin #RP 100.

NICHOLS ENGINEERING & RESEARCH CORP.

80 Pine Street, New York 5, New York

3513 N. Hovey St., Indianapolis 18, Ind. • 405 Montgomery St., San Francisco, Calif.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings, are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

You Don't Need a Big Plant to Get Big Savings

21. . . . in mechanical sludge dewatering. Now the smaller plant can cut power costs, eliminate use of chemicals and reduce labor. 4-page bulletin on the "Roto-Plug" sewage sludge concentrator shows how this is accomplished. Write for Bulletin 100 to Nichols Engineering & Research Corp., 80 Pine St., New York 5, N. Y., or check the card-number.

Automatic Engine Control Equipment Manual

23. This catalog contains descriptions of standard automatic and semi-automatic controls and control equipment. General control recommendations, control selection chart, accessory selection chart, safety stop controls and alarm sets are sections covered. For price lists and models available write Synchro-Start Products, Inc., 8151 N. Ridgeway, Skokie, Ill.

Protective Lining for Concrete Pipes and Structures

131. T-Lock Amer-Plate is a tough, long-lasting acid-resistant vinyl sheet lining for concrete pipe and structures which are exposed to corrosive materials. T-shaped ribs pressed in the sheet are embedded in the concrete as it is poured to lock the lining permanently in place. Get full details from Amercoat Corp., South Gate, Calif., or check the reply card for illustrated folder.

Odor Control Treatments for Sewage Plants and Storm Sewers

137. Poly-side odor control treatments have been successfully used by municipalities in eliminating obnoxious odors from sewage plants, storm sewers, garbage and rubbish trucks, refuse cans and public rest rooms. Write Brooks Chemicals, Inc., 3304 E. 87th St., Cleveland 27, Ohio, or check the reply card for literature.

Whatever Your Pumping Needs

152. . . . check the wide applications of Peerless Type A Horizontal split case centrifugal pumps. These continuous duty, general purpose pumps are described and illustrated for you in fact-filled 18-page Bulletin No. B-1300. Get your copy from Peerless Pump Div., 301 West Ave., 26, Los Angeles 31, Calif.

Stationary Diesels For Water and Sewage Plants

167. Engines are four-cycle, 6 or 8 cylinder, in-line models, ranging from 190 to 2150 bhp and from 135 to 1500 KW, are available either naturally aspirated or supercharged, and can be furnished to run as diesel, dual-fuel or gas engines. For Bulletin #115A check the reply card or write White Diesel Engine Div., The White Motor Co., Springfield, Ohio.

Bulletin on Waste Treatment Equipment

289. Equipment covered in Bulletin No. 315-11 includes bar screens, grinders, collectors, skimmers, separators and flocculation equipment. Check the reply card or write Chain Belt Co., Milwaukee 1, Wis., for this data.

Dorr-Oliver Comptreator For Small Sewage Plants

266. An 8-page, 2-color bulletin No. 2315 that describes the Dorr-Oliver Comptreator is available from Dorr-Oliver Inc., Stamford, Conn. Check the reply card for line drawings, flow diagrams and a series of photographs showing the step-by-step installation of the unit.

PUBLIC WORKS for August, 1969



TYLOX RUBBER GASKETS **and REXON PIPE COATING**

provide a "long lease on life" for
storm-sanitary sewers in Hong Kong Bay

This 72" sewer is being installed along a runway at Kai Tak Airport, which juts straight out into Hong Kong Bay. It must handle not only abrasive storm water run-off, but also the acid-laden sewage and petroleum wastes from business buildings, hangars and repair shops of the development. It must perform without failure of the pipe, or leakage of the joints, and for as far into the future as finest engineering, materials and construction methods can make it.

In specifying acid-resistant, compression-sealing TYLOX Rubber Gaskets for the joints, and abrasion-resistant, non-corroding REXON Coating for *extra* protection of the pipe, engineers not only provided to the utmost for the safety and longevity of the system, but made possible substantial savings in construction costs . . . *Flexible* TYLOX is quickly assembled to pipe, and permits fast assembly of the line. It compensates for pipe angularities, permits wet trench jointing and immediate backfilling. Used together, TYLOX Gaskets and REXON Pipe Coating make pipe lines leakproof and acid-resistant *throughout*.

SEND FOR more TYLOX and REXON data and case histories. Hong Kong is typical only of how these companion Hamilton Kent products are used the world over to make leakproof, non-deteriorating sewerage and drainage lines a certainty.



*PROJECT: KAI TAK Airport Development, Government of Hong Kong.

ENGINEERS: Scott & Wilson Kirkpatrick & Partners, London, S. W. I.

CONTRACTORS: Gammon (Malaya) Ltd., Kowloon, Hong Kong.

PIPE: 18" to 72" reinforced concrete, manufactured by Gamco Pipes Ltd., a subsidiary of Gammon (Malaya) Ltd.

5082

HAMILTON KENT **MANUFACTURING COMPANY**

KENT, OHIO

427 West Grant Street

Orchard 3-9555

To order these helpful booklets check the reply card opposite page 34.

Transite Pipe For Sewer Mains

166. Johns-Manville "Transite" Sewer Pipe, made of asbestos-cement, is available in 11 different diameters ranging from 6" to 36" and in five new crushing strengths to permit greater efficiency in system design. "Ring-Tite" Coupling, designed for high-speed assembly, provides tight, long-lasting seal. Easy-to-assemble Transite sewer fittings also furnished. For complete information, write for brochure TR-165A (Transite Sewer Pipe), TR-94A (Sewer Design Flow Chart), and DS-366 (Transite Material Specification). Johns-Manville, 22 East 40th St., New York 16, N.Y. Check reply card.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check reply card for catalog No. 1702 from Flynn and Emrich Co., Holiday and Saratoga Sts., Baltimore 2, Md.

Incinerators for the Disposal of Combustible Wastes

217. Bulletin 184A from Morse Boulder Inc., New York 11, N. Y. describes fully the basic principles of incineration as to combustion, auxiliary burners, draft and control and elimination of fly ash. Specifications and design of incinerators and hopper doors are included.

Learn About Positive and Easy Valve Operation

304. "LimiTorque" Valve Operators provide push-button control that enables one man to open and close any type of valve quickly and dependably, provide full protection from damage during closing cycle due to torque limiting mechanism. LimiTorque is available for operation by any power source and is readily adaptable to all types of remote control. Catalog L-550 completely describes and illustrates operation and installation. Philadelphia Gear Corp., King of Prussia, Penn.

Gravity Sewer Pipe Engineering Classifications

305. A quick method for choosing the most economical class of asbestos-cement sewer pipe to suit each laying condition with handy crushing table based on the Marston formula is available from Keasbey & Mattison Co., Ambler, Penna. Check the reply card.

Roots Seeking Entry into Your Sewers

315. . . . give up in despair when confronted with pipe joints made with Atlas JC-60 plastic base sewer joint compound. Engineering data are presented in Bulletin M20-3. For your copy write Atlas Mineral Products Co., Mertztown, Pa., or check our card.

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

Sludge Pumps That Can Take It

436. Built by specialists in sewage treatment equipment, these new Dual Valve sludge pumps are described in fact-filled folder written to fit designing engineers' needs. For your copy address Komline-Sanderson Engineering Corp., Peapack, N. J., or circle our card.

Valuable Information on Incinerator Stokers

505. The Combustion Engineering stoker is described fully in Catalog No. 1S-1 which is available from Combustion Engineering, Inc., Combustion Engineering Bldg., 200 Madison Ave., New York 16, N.Y. Schematic drawings of the units, advantages of incineration, firing methods, design and performance are sections covered. Check the reply card today.

Manual on Structural Shapes

479. This 80-page catalog has a wealth of information, engineering data, and tables for engineers, architects and designers of steel buildings and other steel structures. Check the reply card or write Bethlehem Steel Co., Bethlehem, Pa., for your copy.

Descriptive and Performance Data on Sump and Sewage Pumps

483. Performance tables, selection charts, architect's and engineer's specifications and descriptive bulletins on Pacific sump and sewage pumps are available in complete catalog from Pacific Pumping Co., 9201 San Leandro St., Oakland 3, Calif., or by checking the reply card.

Gas and Gasoline Engines Described in Literature

535. Roiline engines (formerly LeRoi), gas and gasoline models are built as bare engines, complete power units, and with components and accessories for special services. Check the reply card or write Waukesha Motor Co., Waukesha, Wisc., for details on the use of these engines in compressor, generator and pumping installations.

Save Money While Pumping Sewage or Storm Water

616. New line of prefabricated pumping stations hold down on-the-job costs and give new economies. Ideal for municipalities, housing projects, sanitary districts, resorts, shopping centers, etc. Address Zimmer & Francescon, 1715 15th Street Place, Moline, Ill., or circle card-number.

Controls For Use in Pumping Stations and Sewage Plants

662. Single and multi-pump sump controls, pressure operated for use in pumping stations and sewage disposal plants are described in literature available from Healy-Ruff Co., Water Level Controls Div., 2255 University Ave., St. Paul 14, Minn. The two principal types of pressure operated sump controls are covered along with general descriptions and features.



How Mud-Jack® corrects sunken slabs

Want an easy, low-cost way to raise settled sidewalks, street slabs, curbs, gutters, driveway approaches? Check Koehring® Mud-Jack. It pumps soil-cement slurry under pressure into small holes drilled through pavement. This displaces air

pockets, water or water saturated materials — raises the concrete slab — leaves firm permanent sub-grade. Two sizes available: A small portable Mud-Jack for cities, a larger model for maintenance, low-cost repairs on highways.



KOEHRING DIV., Milwaukee 16, Wis. Send us new Mud-Jack catalog

NAME _____
TITLE _____
DEPARTMENT _____
STREET _____
CITY, STATE _____ K806 PW

No other filtering medium
compares

ANTHRAFILT®

Anthrafilt stands alone
as the one Filtering Medium
that is best for all types of filters

Years of efficient and economical use in every type of filter plant has made ANTHRAFILT the standard of excellence in the filtering medium field.

ANTHRAFILT

offers important advantages over sand and quartz
DOUBLES length of Filter runs • REQUIRES only half as much wash water • KEEPS Filters in service over longer periods • INCREASES Filter output with better quality effluent • GIVES better support to synthetic resins • PROVIDES better removal of fibrous materials, bacteria, micro-organic matter, taste, odor, etc. • IDEAL for industrial acid and alkaline solutions • EFFECTIVE filtration from entire bed • LESS coating, caking or balling with mud, lime, iron, or manganese.

IDEAL FOR USE IN EVERY TYPE OF FILTER
Write for further information, test samples and quotations to:

PALMER FILTER EQUIPMENT CO.
P. O. Box 1696—822 E. 8th St., Erie, Pa.

Representing:
ANTHRACITE EQUIPMENT CORP.
Anthracite Institute Bldg., Wilkes-Barre, Pa.

COMPARE BUFFALO-SPRINGFIELD 3-WHEEL ROLLER WITH ANY OTHER

TAKE a good look into the Buffalo-Springfield 3-wheel roller . . . compare it with other makes on the market. You'll find solid reasons why the Buffalo-Springfield 3-wheel has long been a favorite among contractors. Here are just a few advantages: each drive roll has heavy-duty, double-shoe type, self-energizing power brakes. *All* rolls run on tapered roller bearings. Field-proved 4-speed transmission delivers a full range of road speeds at full power. All internal parts operate in oil bath. Bevel gear differential provides smoother operation around curves.

When the 3-wheel does need adjustments —

and this doesn't happen too often — they can be made in minutes. Large inspection covers give quick access to all working parts. You don't have to dismantle one part of the machine to get at service points . . . save time. Clutches are well forward of drive rolls and protected against dirt and grit by metal shrouds. Both are readily accessible at all times.

For the full story on the quality Buffalo-Springfield 3-wheel roller, and facts on how it can save you money over the long haul, see your Buffalo-Springfield distributor. Variable weight 10-14-ton and 12-15-ton models available.

86



BUFFALO-SPRINGFIELD CO.
Springfield, Ohio

K A Division of
KOEHRING
Company

To order these helpful booklets check the reply card opposite page 34.

For
Quality
Water Service
Products . . .

It Pays to Buy



CURB STOPS

One of a
complete line of
Water Service
Products

GENERAL PRODUCTS DIVISION
HAYS MFG.CO.
ERIE, PA.

Clean Sewers Cost Less Than New Ones

554. Here is news on 1960-models sewer-cleaning equipment that can keep money in your municipal pocket. To get latest literature on the O'Brien line just write O'Brien Manufacturing Corp., 5632 Northwest Highway, Chicago 46, or check the card.

Small Unit Sewage Treatment For 20 to 5000 People

568. Bulletin 135A describes the Rated-Aeration process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Diversey Parkway, Chicago 14 Ill.

Catalog on Steel Grating

665. New ideas in flooring, walkways, stairs, treads, platforms and shelving are covered in Catalog 2527R available from Blaw-Knox Co., Dept. W., Pittsburgh 38, Pa. Check the reply card for information on choice of cross bar and bearing bar designs and spacings.

Full Line of Sewer Cleaning Equipment

681. Everything for rodding sewers from hand operated equipment to the fully mechanized SeweRoder. Tools for all types of stoppages are operated by Flexicrome Steel Sewer Rods. Featuring the Truck Loader which dumps sewer deposits directly into truck, a complete range of Bucket Machines is offered. All equipment is described in 48-page Catalog 55-A. Flexible, Inc., 3786 Durango Ave., Los Angeles 34, Calif.

You are not Seeing Double

688. The Well submersible sewage and sump pumps actually offer a choice of two motors, two controls, MICRO switch controls start and stop pumps, alternate pumps, and to provide high water alarm. Get Booklet SE-860 for complete engineering information from Weil Pump Co., 1526A N. Fremont St., Chicago 22, Ill., or circle card number.

CONSTRUCTION EQUIPMENT AND MATERIALS

Make Your Utility Tractors Still More Versatile

43. How to use them to full advantage, what matched equipment can be had to enlarge tractor operations and keep costs down by keeping your tractors busier is described in new Catalog UT-111. For your copy write Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wisc.

Useful Attachments for "Payloador" Tractor Shovels

95. Increased versatility for Hough "Payloador" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc.

Bring Yourself Up-to-date on Tractors and Mowers

102. Three new brochures are now ready to do that for you. Color-illustrated, fact-packed and with a time-saving manner of presenting what you may want to know. Get Forms 1-1060A, 1-1070 and A1236 from The Oliver Corp., 400 W. Madison St., Chicago 6, Ill., or circle our card-number.

Self-Propelled Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 524 T, model W-2 and a new mid-gut ditcher, model 4 T, or light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 524 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4 1/2 feet deep. Model W-2 ditcher digs from 2" wide up to 4" down to a depth of 30". Full data on these ditchers available by checking the reply card.

Seven New Models of Tractor Shovels

117. To deliver maximum production combined with fast, economical operation two new models have been announced. Each has three interchangeable buckets and the famous Trojan Safety Curve Lift Arms. Ask for specification bulletins from The Yale & Towne Mfg. Co., Trojan Div., Batavia, N. Y., or circle their number on the card.

Backfill Rammer Packs a Heavy Punch

120. Powerful Wacker Model GVR 100-C Rammer weighs only 115 pounds so it's in the Bantam-weight class, but it delivers ten powerful blows per second to compact 20 square feet per minutes. Durable, compact and easy to operate, it gets into tight corners and meets toughest compaction requirements. Full details from Wacker Corp., Hartford, Wisc.

Hopto Hydraulic Excavators in 1/8 to 1/2 Yard Size

299. Five models of Hopto backhoes, all featuring heavy-duty boom, positive uninterrupted swing, 180° wrist action, dual purpose stabilizers and easy-to-use controls are described and specified in an informative 12-page booklet. Get your copy of Form H-5719 from Badger Div., Warner & Swasey Co., Winona, Minn. Check the inquiry card.

Complete Line of Road Rollers and Compaction Equipment

520. Buffalo-Springfield's complete line of road rollers and compaction equipment is described in a 12-page illustrated Bulletin No. 5-73-157 just released by Buffalo-Springfield Co., Division of Koehring Co., Springfield, Ohio. Check the reply card for on-the-job pictures, as well as construction details of the 2-axle tandems, 3-axle tandem, 3-wheel rollers and the K-45 Kompactor.

Complete Line of Asphalt Patching Mixers

586. Mixers capable of mixing 3 to 20 tons of hot mix per hour are described in literature available from McConaughay Mixers, Inc., Lafayette, Ind. Check the reply card for full information on patching, repairing, resurfacing and sealing.

A Completely Hydraulic Ladder

610. This completely hydraulic ladder is described in a new catalog published by J. H. Holan Corp., 4100 West 150th St., Cleveland 11, Ohio. Detailed drawing of the pedestals, throttle control and ladder construction are included.

Literature on Concrete Gunning Equipment

695. The application of gunned concrete and allied equipment used for mixing the dry blend mix for this operation is described in Form No. C7-59, furnished by the Air Placement Equipment Company, 1000 West 25th Street, Kansas City 8, Missouri.

Catalog on Utility Bodies and Equipment

698. General Service Bodies; Maintenance Bodies; Line Construction Bodies; Mechanical and Hydraulic Aerial Ladders; SKY-MAN-TERS (Aerial Devices); Winches; Hydraulic Derricks; Pole Trailers; Hydraulic Cable Reel Trailers; and Related Accessory Items of Equipment. Write McCabe-Powers Body Co., 5900 N. Broadway, St. Louis 15, Mo.

WEED CONTROL

Control Weeds and Brush Along Highways

640. Literature from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio, describes how use of weed and brush killers help reduce accidents and also included is a handy, ready-reference control chart that covers weed control problems, quantity of solution to use and economical application. Check the reply card.



On wheels or tracks... IH-tough!

New standards of performance and economy over the widest range of work are being set by the International® 340 and its running mate on tracks, the T-340 crawler. From rugged steel grille to heavy-duty final drive, these IH-tough units lead their fields for built-in stamina—day-in, day-out dependability.

For even greater capacity see the 61 hp* International 460. Smooth six-cylinder engine, greater built-in brawn provide unequalled strength, traction, and stamina for top performance on your heavy-duty operations.



Tops in fuel economy, too! Combining 47 engine hp* with greater built-in weight for sure-pulling traction, owners everywhere report remarkably low fuel consumption. Crisp, faster-working hydraulic power shortens each work cycle. Then, shortcut job time even more with optional Fast Reverser, or Torque Amplifier drive. Fast Reverser gives five speeds coming and going to speed shuttle-type work. TA gives 10 speeds forward, lets you boost push or pull-power up to 45 per cent in any gear, *on-the-go*, without shifting for those heavy drawbar loads.

You'll boost earnings by cutting costly downtime with rugged, stamina-proved IH tractor power—seven sizes, 13.4 to 95 hp*. Ask your dealer for a demonstration. Or, write for catalog. International Harvester Co., Dept. PW-8, Box 7333, Chicago 80, Illinois.

*Maximum flywheel hp at standard conditions.



INTERNATIONAL HARVESTER

To order these helpful booklets check the reply card opposite page 34.

STREET LIGHTING AND TRAFFIC CONTROL

Much Cheaper than Cops . . .

31. is good street lighting in preventing crime. To guide you to better lighting there is a new Kerrigan booklet. "A Bright City is a Safe City." Describes full line of lighting standards, also how to promote better lighting in your city and county. Address, Lighting Standard Div., Kerrigan Iron Works Co., 1033 Herman St., Nashville, Tenn. or use our card.

Traffic Control Goes Faster

500. . . when you use "Safe-T-Cone" traffic guides. Flexibility of traffic control speeds pavement striping, eases traffic diversion. New features, new models, new uses are all described in literature of Radiator Specialty Co., Charlotte, N. C. Write direct or circle the reply card.

Highway Lighting Engineering Guide

207. This catalog is primarily aimed at the new highway lighting program that is being undertaken nationally. It gives data on the quantity of light required; lighting on main traffic lanes, interchanges, intersections, toll plazas and bridges. It also covers information on the relative cost of lighting and the selecting of the light source. Write to Westinghouse Electric Corp., Lighting Div., 1216 West 58th St., P. O. Drawer 5817, Cleveland, Ohio.

For Fast, Accurate, Economical Traffic Line Painting

327. The Mark-Rite Line Marker can stripe one, two or three lines, in one or two colors, with skip lines or solid. Check all features by getting new 12-page brochure from Universal Manufacturing and Sales Co., 424 West Redondo Beach Blvd., Gardena, Calif., or check the card-number.

Complete Catalog on Traffic Control Equipment

240. All types of controllers, PR system of coordinated traffic control, vehicle detectors, timers, vehicle counters and radar speed meters are covered in catalog available from Automatic Signal Div., Eastern Industries Inc., Norwalk, Conn. Check the reply card.

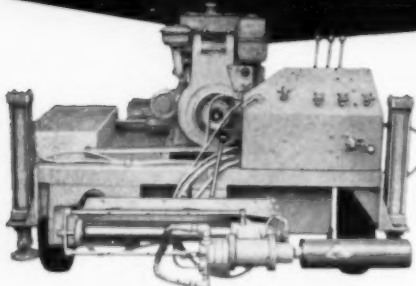
Manual on All Types of Traffic Signs

379. This 26-page manual covers regulatory, warning, school, railroad, street name, road construction, route markers, miscellaneous signs and plastic reflectors. Check the reply card or write The Miro-Flex Co., Inc., 1824 East Second St., Wichita 14, Kans.

Literature on Reflective Glass Beads

571. Glass beads for traffic signs and street name signs are described in literature available from FLEX-O-LITE MFG. CORP., 8301 FLEX-O-LITE DRIVE, P. O. Box 3066 (Afton Br.) St. Louis 23, Mo. No. 831 high index of refraction glass beads for white and yellow backgrounds and UB 68 medium index of refraction glass beads for reflectorizing dark colors such as red, green, blue, etc.

specify **MOBILE**
hydraulic powered DRILLS
for speed, power, economy...



MARK V

It's the only diamond coring machine designed and built specifically for production-type concrete test coring on highways, aircraft runways and other slab-type masonry structures. Also available without custom-built trailer for mounting on 3/4 ton utility truck.



DIGGER

Production type earth auger bores holes for utility poles, guard rails and similar installations with lightning speed.



B-40 EXPLORER

Lightweight B-40 core drills to 250' and augers to 100'. It's a natural for diversified soils exploratory work and all-round utility.



MARK IV

Diamond masonry drilling machine has exclusive automatic hydraulic feed. It's lightweight, portable, easy to use.

Mobile offers a complete line of hydraulic rotary drilling machines, soil sampling equipment, diamond masonry coring machines, diamond bits, drilling tools and equipment.

MOBILE DRILLING, Inc.

960 N. Pennsylvania Street • Dept. 10
Indianapolis 4, Indiana

REFUSE COLLECTION AND DISPOSAL

Reduce Your Refuse Disposal Costs

150. A complete line of refuse disposal systems that include containers, giant compactors, compaction bodies and compaction trailers are described in literature from Dempster Brothers, Dept. PW, Knoxville 17, Tenn. Check the reply card for data on these efficient systems.

Versatility, Compaction Force Account For Extra Packer Capacity

159. The many advantages of this modern packer unit have been combined into a fact-filled bulletin entitled "The Big Squeeze" which is available from E-Z Pack Div., Hercules Galion Products, Inc., Galion, O.

Load-Packer 600 Points the Way to the Best in Refuse Collection

188. Bulletins W-200, W-220 and W-221 explain how the Gar Wood Load-Packer gives faster operation, bigger payload, more compaction, a larger hopper and more dependable operation. Write Gar Wood Industries, Inc., Wayne, Mich., or check the reply card for full details.

Literature Describes M-B Contain-O-Pack System

190. A 6-page catalog describing the M-B Contain-O-Pack, a complete low cost containerized refuse system for private haulers and municipalities is available from M-B Corp., New Holstein, Wis. Check the reply card.

General Specifications for Refuse and Garbage Trailers

251. Two bulletins, one on the Pak-Mor 38 cu. yd. tandem axle trailer unit and the other on the Pak-Mor 32 cu. yd. trailer for use with Model GRD Dempster are available from Pak-Mor Manufacturing Co., Box 14147, San Antonio, Texas. General specifications, power train, operating procedures, maintenance and lubrication and other helpful information are included.

Methods and Benefits of Sanitary Landfill

409. Information on Sanitary landfill methods, organization and necessary equipment with which to carry out the job is available from the Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Progress in Refuse Removal

495. . . registers a new high mark with the Hobbs Hyd-Pak 60 model. Gives lower loading height, watertight body, 3 "extra" yards all in one ultra-modern, piece of equipment. For details on this unit and a pick-up container system, address the Hobbs Hyd-Pak Division, 609 N. Main St., Fort Worth, Texas.

So durable it outlives the project . . .

Galvanized Beth-Cu-Loy Drainage Pipe

For over 50 years thousands of corrugated metal pipe installations have been studied. These studies show clearly that drainage structures made of galvanized corrugated Beth-Cu-Loy steel sheets are as durable as you could want. That's one reason why you can figure that Beth-Cu-Loy pipe will probably outlive the original drainage need.

A Beth-Cu-Loy drainage structure gets its durability from two sources. First, the strong copper-bearing steel sheet itself; second, the tightly-adherent corrosion-resisting zinc coating (2 oz per sq ft by triple spot test). These two ingredients combine to give you a pipe that is strong, long-lasting, light in weight, flexible.

And flexibility is important, too. It is the flexibility of a Beth-Cu-Loy pipe that transfers some of the imposed load to the surrounding material. Many states actually specify the use of corrugated steel pipe under fills of less than 2 ft or more than 15 ft. The product lends itself to the pipe-arch design where low headroom is a factor.

A Beth-Cu-Loy pipe is easy to handle and install; requires a minimum of engineering. Field joints can be made in minutes without delays for setting or curing. The Beth-Cu-Loy sheets conform in all respects to the specs of the AASHO. Ask your fabricator for full details about drainage structures made from corrugated galvanized Beth-Cu-Loy.

BETHLEHEM STEEL COMPANY

BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



for strength

... economy

... versatility

BETHLEHEM STEEL



Tar-enameled Beth-Cu-Loy corrugated steel pipe being installed as storm sewer along eastern Pennsylvania road. The pipe should easily outlast this drainage need.

To order these helpful booklets check the reply card opposite page 34.



us kids like it
...because PERMA-LINE stripes don't
rub off at school crossings like
paint does."



Mr. Traffic Engineer, you owe it to your community's children to protect their future with sound traffic safety planning.

That's why PERMA-LINE thermo-plastic compound belongs in your future...and theirs. Because only PERMA-LINE is still on the job on any street—"when paint just ain't!"

PERMA-LINE traffic markings apply at 400° F. and last 8-to-10 times longer than paint...with one easy application. You owe it to yourself—and your community—to save time, money and trouble with wonderful, wonderful PERMA-LINE. You'll be so glad you did.

perma-line

VEON CHEMICAL CORPORATION • 22-09 BRIDGE PLAZA NORTH • LONG ISLAND CITY 1, N.Y.
PERMA-LINE (CANADA) LTD. • 299 BERING AVENUE • TORONTO, CANADA

For your free copy of
our brochure showing
latest installations and
specifications, return
this coupon.

NAME _____ TITLE _____
ADDRESS _____
CITY _____ STATE _____

STREETS AND HIGHWAYS

Don't Stand There Figuring!

51. Use the new Forney PSI Calculator "slide rule" for concrete products that includes instant conversion data from total load to psi on 17 standard test specimens and masonry units. Pocket size. Free. Address Forney's Inc., Tester Div., Box 310, New Castle, Pa.

New Literature on Tractor Loaders

55. Full illustrated descriptions on Allis-Chalmers TL-12 and TL-14 Tractor Loaders are furnished in bulletins MS-1386 and MS-1373 respectively. Write Allis-Chalmers Construction Machinery Div., Milwaukee 1, Wis.

"DUO-PACTION" is Real Compaction!

73. The workings of compaction and surface rolling with a single machine is described in well-illustrated brochure SG25-5812 which also covers Seaman-Gunnison Scrapers, Distributors and Flushers. Get the full facts from Seaman-Gunnison Div., Box 3025, Milwaukee 18, Wis., or circle our reply card.

Fallacies of the "Low Bid"

78. ... were never better exposed than in this thoughtful new booklet titled "The Best Bid for Your Budget." Reveals the hidden factors that often make the "low bid" the high bid in purchasing motor graders. For your copy of Form E014, write Caterpillar Tractor Co., Peoria, Ill., or check the inquiry card.

The Brush Chipper With Ten Exclusive Advantages

128. Brush chipper features worth investigation are described in Mitts & Merrill Catalog 460. Advantages include ability to cut two sizes of chips. Catalog illustrates uses and gives specifications of "Beaver" Chipper. For your copy, write Mitts & Merrill, 1009 S. Water St., Saginaw, Mich., or check reply card.

Chain That Pays For Itself

154. Aluminum chain for protective barriers for roads, parking lots and work areas, and as guard rails inside water, sewerage and electric plants, pays for itself by eliminating maintenance. For specification folder, price list and sample links, address Bison Aluminum Chain Co., Inc., Dept. C-P, 249 Hertel Ave., Buffalo 7, N. Y., or circle number on card.

Chip Dollars from Your Overhead With Fitchburg Chippers

160. Detailed cutaway drawings, specifications, diagrams, charts and money-saving reports and experiences are covered in catalog available from Fitchburg Engineering Corp., Dept. PW, Fitchburg, Mass.

To Sweep a Better Street for Less

162. Find out about what Prostran can do to make your street sweeper brooms last longer, cut "down-time" and lower your cost per sweeping mile. A folder, with sample polypropylene filament is yours for the asking from E. B. & A. C. Whiting Co., Burlington, Vermont.

Making a Clean Sweep

345. ... on streets, parking lots, airport runways, etc., is the specialty of the Tennant Model 100 Vacuumized Sweeper. Large-capacity machine sweeps a 7'4" path. 6-page illustrated bulletin tells all you want to know of its advantages, operation and efficiencies. For your write G. H. Tennant Co., 721 N. Lilac Drive, Minneapolis 22, Minn., or circle the reply card.

For Better Work All Over Town


525. Put a Bantam in your life. On trenching, excavating, street and highway work this handy versatile crane-excavator obviates using larger equipment in many cases. Saves time and dollars. Get descriptive literature from Schield Bantam Co., 301 Park St., Waverly, Iowa or circle card-number.

Pre-Assembled Dowel Units For Highway and Airport Construction

537. Laclede dowel assemblies for expansion, contraction and construction joints are precision welded into one unit and are maintained in rigid alignment. For full details write Laclede Steel Co., St. Louis, Mo.

(More listings on page 54)

Is a **FITCHBURG CHIPPER** your answer to speedy, economical brush removal?



OFFICE OF SUPERVISOR OF ROADS
COUNTY OF BERGEN

Mr. W. O. Ferman, President,
Fitchburg Engineering Corp.,
Fitchburg, Massachusetts.

Dear Mr. Ferman:

I thought I would take few minutes to inform you...

...one or two men... 450 miles of county road...

State of Rhode Island and Providence Plantations
DEPARTMENT OF PUBLIC WORKS
BUREAU OF HIGHWAY AND BRIDGE MAINTENANCE SECTION

September 24, 1956

President Fitchburg Engineering Corporation

The second year our Fitchburg Chipper has been used...

...steps up our brush removal...

City of Westfield, Massachusetts
FORESTRY DEPARTMENT

June 17, 1957

Very Respectfully,

...costs little to maintain...

A City, a County, a State have found the Fitchburg Wood Chipper to be their answer to difficult brush removal. These short quotations from out of many testimonial letters show how quickly Fitchburg can solve a difficult municipal expense—brush removal.

City of Westfield, Massachusetts:
"costs little to maintain."

Bergen County, New Jersey:
"one or two men... for 450 miles of County Road."

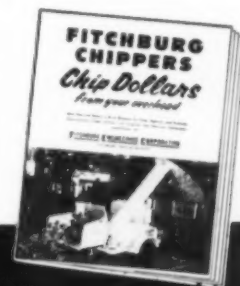
State of Rhode Island:
"steps up our brush removal."

Your City, County, and State, too, can discover these advantages when your maintenance crews use Fitchburg Chippers. Brush crews like the safety of the patented safety spring-activated feed plate—a Fitchburg exclusive—that adjusts itself automatically when brush is fed into the Chipper.

They use the disc-clutch that gives Fitchburg a fast stop-start for added safety. Park crews find that Fitchburg's low maintenance, normal lubrication, and tough, chrome steel knives hold their keen edges to keep their chippers working... fast!

Look to Fitchburg when you need brush chippers. Check Fitchburg's One Year Guarantee... Fitchburg's overall specifications. See the safety features... the rugged construction built for long, hard-working service. Your city, county, and state maintenance crews will speed up their brush removal. Make a Fitchburg Wood Chipper your answer to difficult brush removal.

NEW FREE BOOK
"Chip Dollars From Your Overhead." 20 pages. Complete with cutaway color drawings of Fitchburg Chipper in action. Specifications, etc. Write for your copy. Address Dept. PW-68.



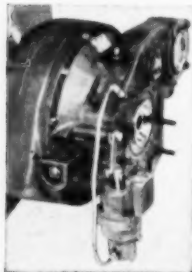
FITCHBURG ENGINEERING CORPORATION
FITCHBURG, MASSACHUSETTS

Solid reasons why INTERNATIONAL® MEET ALL YOUR



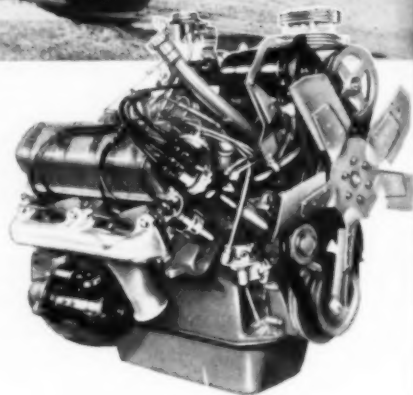
Wide range of V-8 power and chassis to keep your jobs moving!

INTERNATIONAL V-Line Trucks provide your operation with 58 four- and six-wheel heavy-duty truck models, conventional or COE design. Powered by a choice of three INTERNATIONAL heavy-duty V-8 engines, all with friction minimizing short-stroke, they offer the gasoline or LPG power you need to get the job done right and on time. Here is a full range of truck capacity and engines to match your increasingly diversified needs.



♦ FLYWHEEL POWER TAKE-OFF

SEE it at the APWA Congress and Equipment Show! Now you can increase payloads and working life with direct drive flywheel power take-off. INTERNATIONAL factory mounted option on heavy-duty "six" or V-8 engines eliminates power take-off at the front end. Direct gear drive off flywheel gives you up to 75 hp. at output shaft. There are



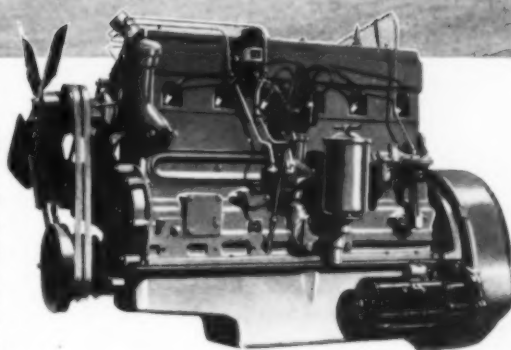
no belts to replace, no excessive parts to wear out . . . maintenance and downtime are kept to a minimum. One central pump can do "all the work"! See the new INTERNATIONAL direct drive flywheel power take-off at this year's INTERNATIONAL Truck display . . . APWA Congress and Equipment Show, New York City.

TRUCKS POWER DEMANDS



Proven dependable over the years for all types of work!

INTERNATIONAL R-Line Trucks, perfect for municipal operations, are heavy-duty units of conventional design in the 21,000 to 45,000 pound GVW range. INTERNATIONAL Red Diamond six-cylinder engines provide these four- and six-wheel models with long-run economy and dependable power for the toughest jobs. Featuring valve-in-head, high-torque design, plus advanced engineering techniques in carburetion and manifolding, they offer a complete line of gasoline or LPG power to match your exact needs.



INTERNATIONAL® TRUCKS WORLD'S MOST COMPLETE LINE **IH®**

International Harvester Company, Chicago • Motor Trucks • Crawler Tractors • Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

To order these helpful booklets check the reply card opposite page 34.

Big Tractor Shovels for Big Jobs

93. New 4 color bulletin describes two largest capacity "Michigan" tractor shovels. Gives specifications, illustrations and suggested applications that make these big machines pay. Write for Bulletin TS2500 to Construction Machinery Div., Clark Equipment Co., Pipestone Plant, Benton Harbor, Mich., or circle our card-number.

Illustrated Specifications on Brush and Limb Disposal

222. A new booklet on the modern approach to the brush problem shows how an Asplundb chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundb Chipper Company, 501 York Road, Jenkintown, Pa., or use the handy reply card.

Power Tamper for Granular Soil and Bituminous Surfacing Work

342. The Kelley Power Tamper is a self-propelled unit that is equivalent to a 10-ton roller for backfilling, road widening jobs and compacting around culverts and pipeline trenches. For complete specifications write Kelley Machine Div., Wiesner-Rapp Co., Inc., 285 Chicago St., Buffalo 4, N. Y., or check the reply card.

Levels Sidewalks and Curbs Quickly and Easily

510. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the reply card.

Design Manual on Sectional Pipe Pipes, Arches and Pipe-Arches

550. Size and weight tables, minimum gages for live load strutted and unstrutted, layout details and plan developments are some of the material covered in this manual. Write American Bridge Div., United States Steel Corp., 525 William Penn Place, Pittsburgh, Pa., or check the reply card today.

Bitumuls Paving Handbook Full of Useful Data

23. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the reply card. American Bitumuls & Asphalt Co., 320 Market St., San Francisco 20, Calif.

Paints For Bridges, Water Tanks & Other Metal Structures

258. Flake silica graphite paints for outdoor metals are described fully in literature from Paint Sales Div., Joseph Dixon Crucible Co., Jersey City 3, N. J. Check the reply card for details on these primer and protective paints.

Catalog on Transits, Levels and Surveying Equipment

435. Warren-Knight field equipment for surveying is covered in a 26-page well illustrated catalog. Specifications, models and prices are included. Check the reply card or write Warren-Knight, 136 North 12th St., Philadelphia.

1960 Truck Line Story From Chevrolet

446. The 1960 Chevrolet truck line is described fully in literature from Chevrolet Motor Division, General Motors Corp., General Motors Building, Detroit 2, Michigan. Check the reply card for data on this line of 165 models.

Information on Trucks for Every Job

632. Literature on the complete IHC truck line is available from International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. Included is information on basic models, conventional and COE, 4-wheel, 6-wheel and four-wheel-drive. Check the reply card.

How to Get Better Concrete Bonding

307. Whether your problem is bonding old to old concrete, new or fresh concrete to old concrete, or remedial patching and anti-skid surfacing, there is help in a very new informative booklet on Thiokol liquid polymer epoxy concrete adhesive. Just write Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J., or check our card number.

Get "Down to Earth" Quickly With Mobile Drill's "Explorer"

646. Multi-purpose drill augers to 75 ft.; core drills to 500 ft.; bores holes up to 24-in. diameter. Full details on this powerful yet lightweight unit from Mobile Drilling, Inc., 960 No. Pennsylvania St., Indianapolis 4, Indiana. Check the reply card.

To Heat and Re-Mix Stockpiled Asphalt

654. . . . the Wylie HEAT-A-MIX Tail-gate Asphalt Mixer can ease your labors. New 4-page fully illustrated brochure describes how it works and why you need it. Address Wylie Mfg. Co., Box 7086, Oklahoma City 12, Okla., or circle above number on card.

Here's a King-Sized Sucker-Upper . . .

656. . . . that will rid your streets and gutters of leaves, litter and other bulky materials in record time. Cleans catch basins to 8-ft. depth in minutes. Bulletin PL 758. S describes and illustrates this motorized Sucker. Address Good Roads Machinery Corp., Minerva, Ohio, or circle number on card.

Design of Concrete Pavements For City Streets

657. Sections covered in this manual are classes of streets as to traffic, quality of concrete, working stress and safety factor, types of pavement design, design procedure, jointing of municipal pavements and use of distributed steel. Check the reply card or write Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill.



*THE NAME ORANBURG AND THE SILVER BAND ARE REGISTERED TRADE-MARKS OF THE ORANBURG MANUFACTURING CO.

Over 300 million feet in use coast to coast!

The test of time has proved the high quality of Orangeburg Root-Proof Pipe and Fittings for house sewer lines, downspout run-offs and other underground, non-pressure uses.

Orangeburg's Taperweld Joints seal root-proof and watertight. No leakage, no infiltration. And because it's made of a strong, tough non-metallic material, Orangeburg does not rust. Alternate freezing and thawing . . . acids and alkalis found in ground water and sewage do not affect it.

All these qualities plus speed, ease and economy of installation have

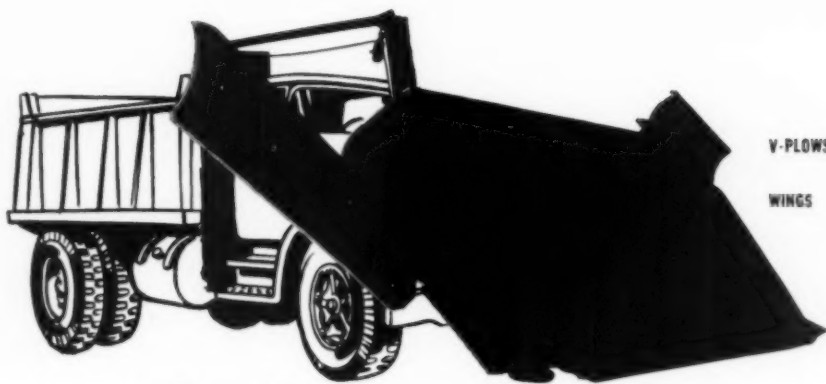
gained for Orangeburg a growing acceptance among leading approving authorities, architects, engineers, builders and plumbers. Today, over 300 million feet of Orangeburg are in service from Maine to California.

The Silver Band* identifies genuine Orangeburg: Root-Proof Pipe for sewer lines; Perforated Pipe for foundation drains, septic tank disposal fields. Orangeburg exceeds requirements Federal Spec. SS-P-356 and Commercial Standard CS 116-54. Write Dept. PW-80 for Engineer's independent report.



ORANBURG MANUFACTURING CO.
Division of The Flintkote Company, Manufacturer
of America's Broadest Line of Building Products

genuine ORANBURG
Root-Proof Pipe and Fittings



V-PLOWS from 8' to 9½' swath—
nose heights 30" to 54"
WINGS 10' to 12'—partial or
complete hydraulic control

*when it's
"what's up front
that counts"...*

BE SURE IT'S A GLEDHILL!

Enthusiastic operators and owners everywhere . . . throughout America, Canada and Europe . . . endorse the smooth, efficient and powerful performance of Gledhill Snow Plows.

- FITS ALL TRUCKS • EASILY ATTACHED • I-BEAM PUSHFRAME • FOLD BACK HYDRAULIC HOIST
- AUTOMATIC SAFETY BLADE TRIP • SHOES OR CASTERS • ALL TYPES HYDRAULIC CONTROLS
- ALL TYPES ATTACHING DEVICES



STRAIGHT PLOWS reversible—9' to 12' lengths—heights from 29" to 60"



TAPER PLOWS 9' to 12' length of cutting edge—full range of heights and adjustable or one-way

RIGHT-V-LEFT hydraulic control in cab converts right hand taper to "V" and to left taper while truck is in motion

Plus custom designs and sizes to meet every possible requirement



THE GLEDHILL ROAD MACHINERY CO.

builders of the plow with the perfect moldboard

GALION, OHIO

Take a tour of Columbus, Ohio . . .

where Leece-Neville alternators have ended battery problems!



• **The fast, never-resting pace** of patrol cars and emergency wagons in the Columbus Police Department necessitates replacement every 12 to 16 months. According to Sgt. Harry M. Buckner, who heads up police vehicle maintenance, "About 145 of our units are Leece-Neville alternator equipped. We transfer the alternators from old cars to new ones as they are purchased, and one alternator usually outlives three cars."



"**Leece-Neville alternator** systems have been the answer to our battery problems," reports Walter W. Curlis, Superintendent of Municipal Garages (right above). "Not only do they keep our batteries in operating condition at all times, but they give us exceptionally long, trouble-free service that helps keep generator and battery maintenance expense to a minimum."



Fire Maintenance Foreman William H. Miller (second from left above) claims, "We have about 100 pieces of equipment with Leece-Neville alternators—cars, trucks, squad wagons and pumps—and they give us no trouble over the life of our vehicles. Some alternators installed in 1950 are still in service; others have gone better than 100,000 miles. These alternators keep batteries charged, eliminate the need for charger plugs on our cars, and improve radio performance on all of our units."

Columbus, capital city of Ohio, is also noted for its progressive city government, its vast land area compared to population, and its rapidly growing network of modern freeways.

Way back in 1946, when Leece-Neville first introduced the alternator-generator for automotive use, Columbus immediately installed six units for test purposes (3 are still in use). Today the city fleet includes almost 400 vehicles equipped with Leece-Neville alternators. Usage is widespread . . . in police, fire, traffic regulation, electric, water and sewer departments . . . wherever discharged

batteries have been a problem in the past.

Alternators may solve your problem too! But be sure you specify *Leece-Neville alternators*, proved trouble-free during 14 years of actual service in all parts of the country. No other supplier can make this claim! For complete information, mail the coupon below. Leece-Neville also is a leading supplier of DC generators, fractional HP motors, regulators, cranking motors and switches.



Specify Leece-Neville alternator systems as factory-installed special equipment on new vehicles.



20 trucks and 4 cars in Columbus' Traffic Regulation Department are equipped with Leece-Neville alternator systems. Even with a full electrical load of multiple flasher lights and 2-way radios in operation during long periods at engine idle, L-N alternators keep batteries charged.

The Leece-Neville Company, Dept. PW-8
1374 East 51 Street • Cleveland 3, Ohio

Please send me complete information about alternator systems and other products for my type of service.

Name _____ Title _____

Firm or Dept. _____

Address _____

City _____ Zone _____ State _____

Type of Service _____

VERSATILE control



by **IDEAL**

Over half a century experience in the electric motor field has provided Ideal with the design and engineering background to solve any control problem. Custom-designed to individual specifications with the advantages of a number of exclusive features pioneered and developed by Ideal engineers, Ideal equipment is a sound investment for lasting service and protection.

Typical of hundreds of basically similar weather-protected units in use throughout industry, the above control, installed at a large mid-western oil company, houses two large synchronous motor starters, two smaller induction motor starters, two starters for excitation rectifiers, one 230 to 440 volt auxiliary power transformer, a 440 volt distribution panel and a 110 volt lighting and distribution transformer. For other examples of synchronous, wound rotor and squirrel cage induction starters and controls for indoor and outdoor use, or assistance in selecting the exact control for your requirements, write for Bulletin 601 or contact your nearby IDEAL representative.



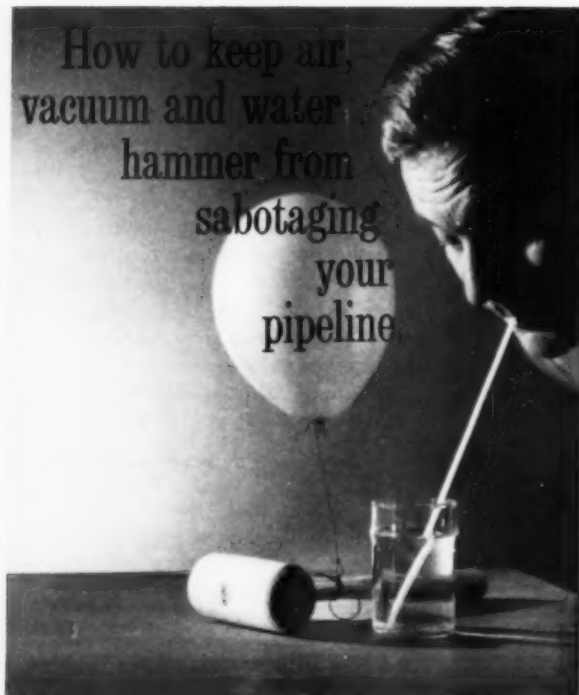
The

IDEAL ELECTRIC
& MANUFACTURING COMPANY

341 East First Street

Mansfield, Ohio

How to keep air,
vacuum and water
hammer from
sabotaging
your
pipeline



A brief Simplex guide to pipeline economy

- 1 Prevents water hammer:** Type CCAV Controlled Closing Air Valve protects against damaging effects of surge and water hammer. Combines functions of an air inlet valve (vacuum breaker) and a controlled closing unit (to prevent sudden water stoppage and subsequent water hammer). 4" and 6" sizes. Capacities from 575 to 5980 gpm. Send for Bulletin 1225.
- 2 Removes excess air:** Type AGFD Automatic Air Release Valve prevents stoppages due to air-lock at high points in line. Has large discharge capacity, excess power to insure opening of the valve against high internal pressure. Can be equipped to hold vacuum, preventing re-entry of air into pipeline through valve. Furnished with 2", 1½" or 1" inlet diameter. Standard valve operates to 250 psig—special to 300 psig. For details, get Bulletin 1206.
- 3 Protects sewage pipelines:** Type "B" Air Release Valve, special for lines carrying sewage or sludge, removes entrained air and gases. Special trap catches sludge, prevents fouling of air-release valve. Relatively simple back-flushing cleans out this trap, maintains top efficiency and protection. Valve itself is same as Type AGFD. Details are in Bulletin 1206.
- 4 Provides three functions:** Type AV Air Release and Air Inlet Valve performs three operations, combines great protection and single-unit economy: (1) Automatically releases accumulated air, (2) admits air to break vacuum, and (3) vents pipeline to permit escape of air when filling system with water. Standard units operate to 150 psi. For full details, send for Bulletin 1205.
- 5 Breaks vacuums:** Type VAC Air Inlet Valve solves two serious pipeline problems: possible collapse of pipelines due to formation of vacuums—and stoppage of flow, caused by air binding, when lines are being filled. Standard units have 4" to 10" inlet diameters, can be assembled in groups to do the work of one large, expensive valve. For 16 pages of detailed information, get Bulletin 1202.

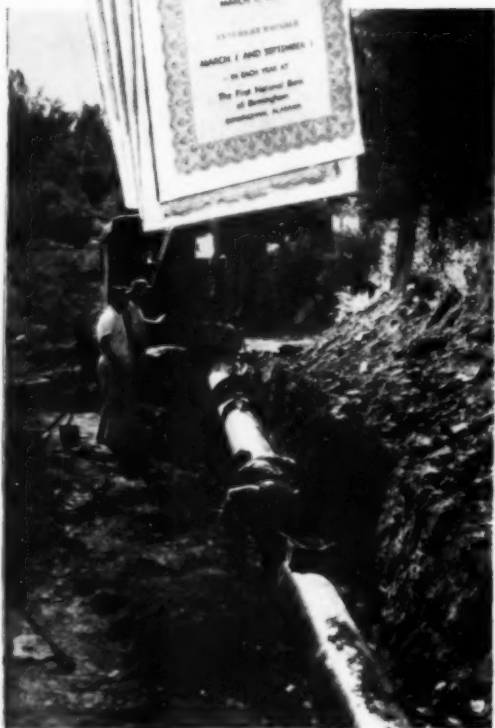
SIMPLEX

VALVE AND METER COMPANY

a division of PFAUDLER PERMUTIT INC.
Lancaster, Pennsylvania

Underwrite Your Bonds for Water Works Improvements with permanent

CAST IRON PIPE



It's important to your city—and investors who buy your bonds for new water works projects—that the life of these improvements should be longer than the debt. This is why large buyers of bonds request an engineer's report with the bond prospectus. They seek assurance that the pipe which will be used in new water works construction will not need replacement or costly repairs before the bonds mature.

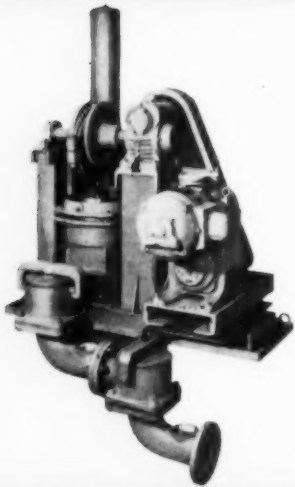
No other pipe has ever matched the trouble-free service record or longevity of Cast Iron Pipe. One hundred American cities are still using cast iron mains laid a century or more ago. Hundreds more have passed the 50-year mark. When your community extends or improves its water system, specify Cast Iron Pipe, which has long been known as

"America's No. 1 Tax Saver."

*This advertisement is published
in the interests of the
Cast Iron Pressure Pipe Industry
by ———*

WOODWARD IRON COMPANY
Since 1882
WOODWARD, ALABAMA

FOR PERMANENT POSITIVE PUMPING



"BUILT FOR WEAR — NOT REPAIR" is the promise behind every Dual Valve Komline-Sanderson Plunger Pump. Designed to provide positive sludge and slurry handling, the Komline-Sanderson standard plunger pump has exceptionally thick wall castings of fine-grained cast iron with 35,000 lb. P.S.I. tensile strength.

"Permanent, positive pumping" means just what it says; reliable, trouble-free pumping and metering year after year. Dual valve pump design provides continuous pumping, regardless of large solids in the sludge.

Compare the rugged construction and numerous exclusive features of Komline-Sanderson Plunger Pumps with others on the market, you'll see why they last longer and are much easier to maintain.

Write for Bulletin No. KSP-3

KOMLINE-SANDERSON
ENGINEERING CORPORATION
PEAPACK, NEW JERSEY
BRAMPTON, ONTARIO, CANADA



LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Low Bid—No Contract

William A. Berbusse, Jr., Inc. v. North Broward Hospital District, 117 So. 2d 550, a Florida case decided Feb. 3, 1960, was an action by the low bidder on the construction of a proposed hospital, against the hospital district, for the loss of profits it would have made had the contract been awarded to it instead of to a higher bidder.

Under Florida law, the hospital district is not required to accept the lowest responsible bidder, but is required to call for competitive, sealed bids for such improvements. The invitation to bid contained the following provisions: "Award will be made to the lowest responsible bidder, provided it is to the Owner's interest to accept the bid."

Plaintiff's low bid was rejected, and a higher bid was accepted. Plaintiff's suit is based on the theory that the invitation to bid was an offer to enter into a contract with the lowest responsible bidder, which it had accepted by being the lowest responsible bidder.

The court held, however, that the invitation to bid was not an offer, but a mere solicitation of offers. No contract could thus arise until the hospital district accepted a bid. Since it never accepted plaintiff's bid, there never was a contract with plaintiff. The court indicated that the result would have been the same even if the letting of a bid to a higher bidder was in violation of a statute.

Consequently, recovery was denied.

Icy Sidewalks

Bury v. City of Minneapolis, 102 N. W. 2d 706, a Minnesota case decided April 29, 1960, was an action by a pedestrian against the city for injuries sustained in a fall in an intersection of a city-owned alleyway and a sidewalk.

On the afternoon of Nov. 21, 1956, Mrs. Bury had been walking in a residential area of Minneapolis. As the sidewalk on which she was walking traverses a public alleyway, there is a grade down of about 6 degrees. As she walked down the incline, her feet slipped from under her and she fell.

It was testified that the sidewalks at the time were comparatively free of snow and ice, and so was the crosswalk except for some patches of ice which did not interfere with safe travel.

There had been a snowfall of 5 inches 6 days prior to the accident. In the intervening time there were 3 days in which slight precipitation occurred. The temperature varied causing the snow alternately to thaw and freeze. The temperature ranged from a maximum of 47 to a low of 13 during this time. As a result, there was not much snow or ice left on the sidewalks, except for a few icy spots in the crosswalk. There were no ruts, hummocks or depressions.

The court held that while a municipality has a duty to eliminate dangerous conditions caused by accumulations of ice and snow, this does not require the municipality to guard against mere slipperiness caused by a natural flow of water from melted ice and snow. Furthermore, there was nothing to show that the city had had actual or constructive notice of the condition complained of.

It was therefore held that the city was not liable, as a matter of law.

Window Washing of Buildings

Gupton v. City of Wauwatosa, 102 N. W. 2d 401, a Wisconsin case decided April 13, 1960, was an action by a window washer against the landlord and tenant, for injuries sustained in a fall from a window ledge while washing windows on a

building not equipped with approved safety devices.

The City occupied the building as tenant. It was used for city offices.

The state industrial commission, which is vested with supervision of the safety of every employment, place of employment and public building had issued orders which required the installation of safety equipment on the window ledges, when window cleaners are employed on such ledges. These safety devices were not installed on this building.

It was argued by the owner of the building that it had no duty to install the safety devices because the place where the accident occurred (the window ledge) was not a "place of employment." The court held, however, that it was a "place of employment," this term being construed to mean a place where an industry, trade or business is carried on. While the city's operations do not constitute "carrying on a business," the court said that the owner's renting the building to the city was the carrying on of its business.

The court also held that the city may be held liable for breach of the safety orders because it is in control of a "public building."

Smoke Abatement

Huron Portland Cement Co. v. City of Detroit, 4 L. ed 2d 852, a case decided by the United States Supreme Court April 25, 1960, was an action in Michigan in which a corporation engaging in operating federally licensed steam vessels in interstate commerce sought to enjoin the City of Detroit from enforcing its air pollution ordinance against its vessels on the Detroit River. Under the ordinance, the corporation's vessels could not, without undergoing structural alteration, perform the necessary cleaning of their fires within the city limits.

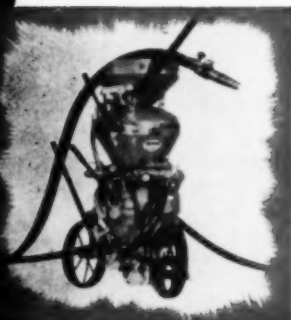
The court (7-2) rejected the argument that federal statutes relating to inspection, approval, and licensing of steam vessels in interstate commerce pre-empted this area, and that the ordinance unconstitutional-ly burdened interstate commerce.

The court said, "Legislation designed to free from pollution the very air that people breathe clearly falls within the exercise of even the most traditional concept of . . . the police power. In the exercise of that power, the states and their instrumentalities may act, in many areas of interstate commerce and maritime activities, concurrently with the federal government."

Public Works Officials in Many Cities, Counties, States and Provinces

**MAKE BUDGET DOLLARS DO MORE WITH
AIRPLACO CONCRETE GUNNING EQUIPMENT**

**When the Job Calls
for Concrete . . . Call for**



AIRPLACO CONCRETE GUNS for Restoration and Repair of Roads, Streets, Bridges, Culverts, etc. Choose from six different models in a complete line of concrete guns. Whatever your production requirements—from 1/2 to 8 cu. yds. per hour—there is an AIRPLACO BONDACITOR or NUCRETOR to meet your needs.

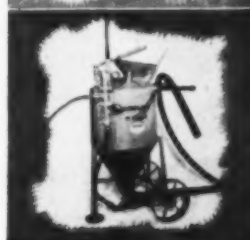
AIRPLACO MIX-ELVATORS

for Faster, Easier Proportioning, Mixing, Elevating and Screening. Choose from three models. Capacity up to 12 yds. per hour.



AIRPLACO GROUTER AND PLACER

for Easy-to-Use, Versatile Grouting and Placing of Concrete and Other Materials. The portable Model G-6 Grouter and CP-10 Placer is ideal for soil stabilization, tunnel backfilling, filling hard to get to forms, etc. Both the G-6 and CP-10 have capacities of up to 5 cu. yds. or more depending on materials used and job conditions.



AIRPLACO JET-BLASTERS For Low-Cost, Easy-to-Use Sandblasting (wet or dry). The Model B-6 single charge (650-lb. capacity) and B-3C continuous feed (500-lb. capacity) Jet-Blasters are designed to handle all abrasive materials for cleaning, polishing, or etching of any type of surface. Jet-Blasters are available with accessories for wet or dry blasting and new exclusive "Sand-Saver" remote cut-off valve.



Let Us Help You Solve Your Concrete Problems Our experience in solving unique problems involving the handling of concrete has saved thousands of dollars for others. This experience is available to you. Write, wire or phone us, anytime.

WRITE FOR FREE CATALOG

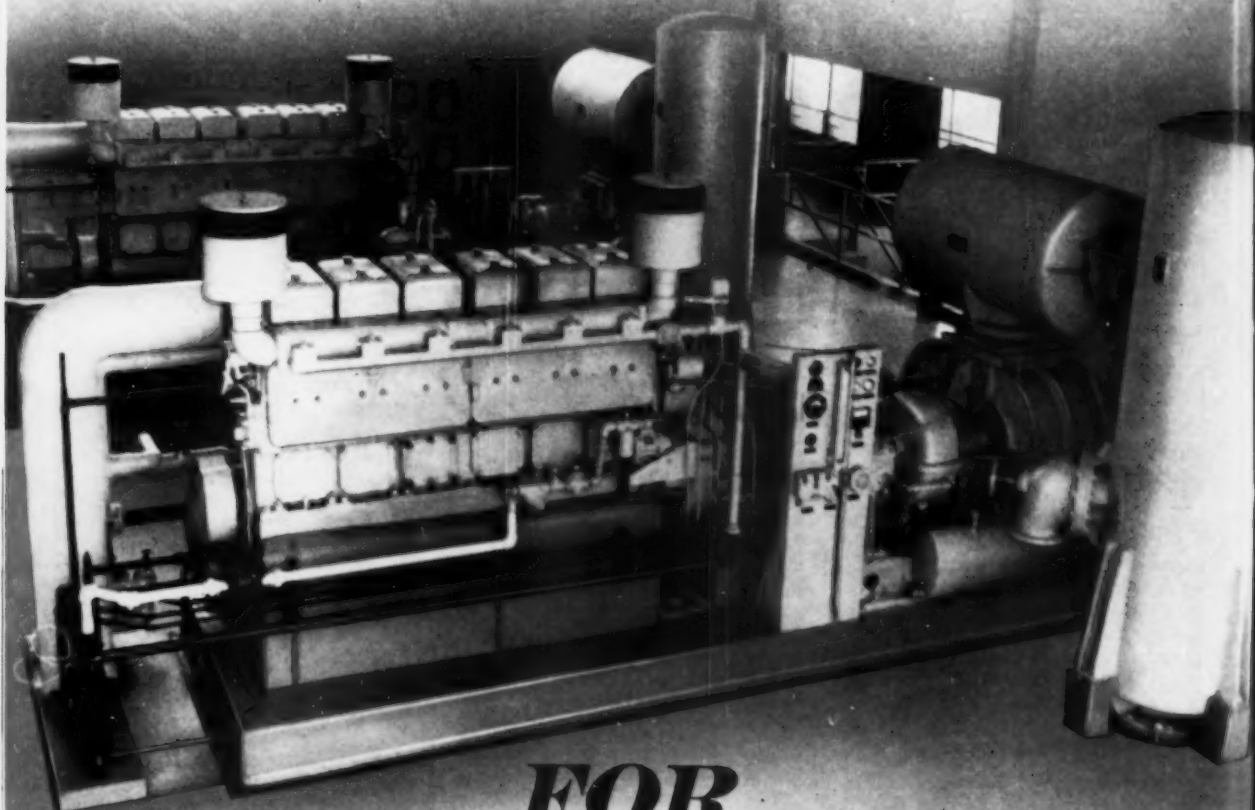


**AIR PLACEMENT
EQUIPMENT CO.**

1013 WEST 25TH ST. • KANSAS CITY 8, MO.

WORLD'S LEADING MANUFACTURER OF "ADVANCED DESIGN" PNEUMATIC PLACING EQUIPMENT

Two CP-69 Dual Fuel Engines in a sewage disposal plant of a large Mid-Western city. Each engine delivers 268 HP @ 600 RPM. Other CP Engines available in ratings from 120 HP to 2280 HP



FOR
performance
FUEL ECONOMY
SERVICE
RELIABILITY

...CP Engines rate highest on every count!



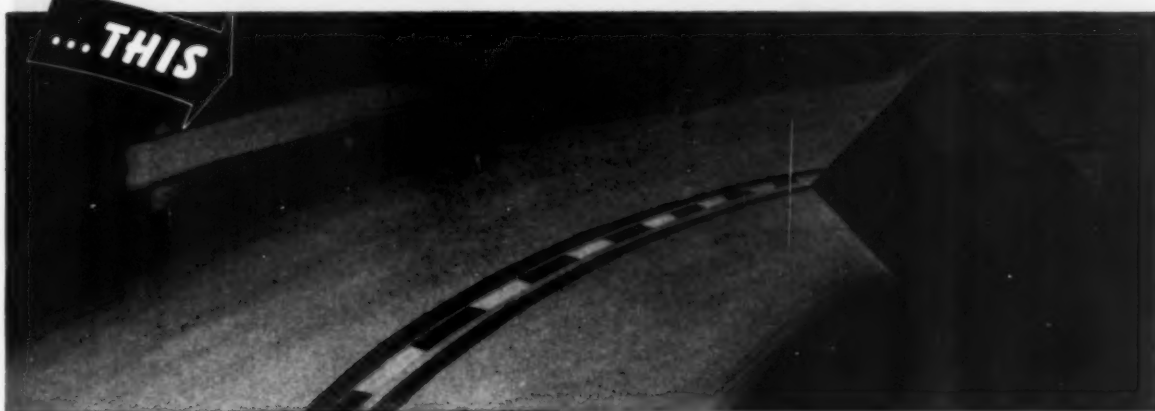
Chicago Pneumatic

8 East 44th Street, New York 17, N. Y.

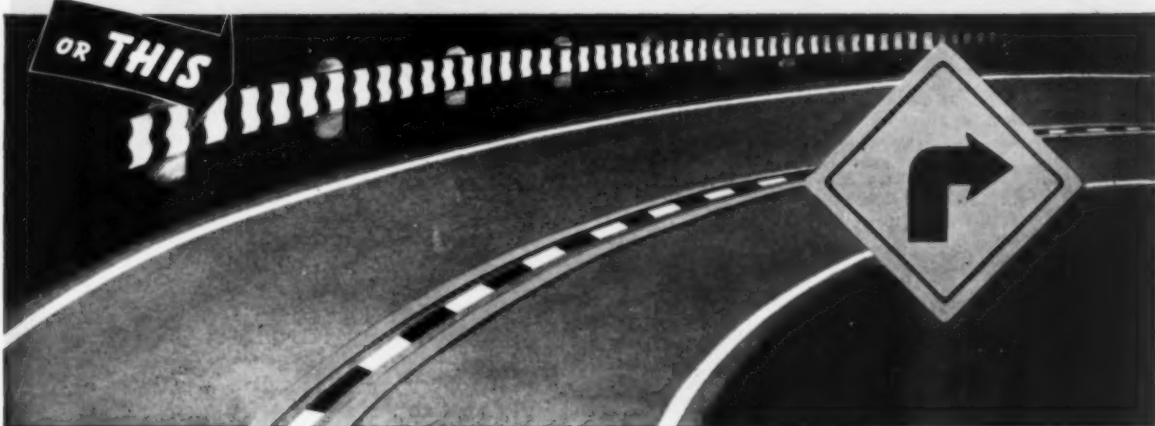
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • REICHdrills

DO YOUR TRAFFIC SIGNS LOOK LIKE...

...THIS



OR THIS



LEAD-FREE REFLECTIVE GLASS BEADS COULD MEAN THE DIFFERENCE

Signs employing the finest reflective materials are adversely affected in a number of ways, such as by moisture, thermal changes and dirt . . . as well as acts of vandalism, accidental breakage and normal wear and tear. Further, the sulphides in industrial fumes attack glass beads containing lead, causing them to turn dark, with a consequent loss of their reflectiveness and visibility. Maintaining adequate visibility through fair weather and foul for maximum safety is a must. To ignore this fact is bargaining with lives. So, it is just common sense to buy lead-free beads that won't turn dark. That's why street and highway engineers specify Flex-O-Lite Lead-Free Reflective Glass Beads—with full confidence in their maximum brilliance and lasting reflectivity throughout a longer life. Specify the beads proved best by test. Insist on Flex-O-Lite Lead-Free Reflective Glass Beads. Write for free, informative brochure.



FLEX-O-LITE MANUFACTURING CORP.

8301 Flex-O-Lite Drive, St. Louis 23, Missouri

Flex-O-Lite of Canada; Ltd., P. O. Box 216, St. Thomas, Ontario, Canada • Paris, Texas

MAKERS OF DROP-ON • FREE-FLOWING
STANDARD • MILITARY • MOISTURE-PROOF • HIGH AND MEDIUM INDEX SIGN BEADS

- **#831 REFLECTIVE GLASS BEADS**—Best for white and yellow signs. Meet and exceed all test requirements . . . microscopic, acid, sodium sulphide, spherical content, gradation.
- **FREE-FLOWING REFLECTIVE GLASS BEADS**—Won't agglomerate. Contain no injurious waxes, oils or resins. Offer perfect adhesion to any suitable traffic bead binder. Economical.
- **TYPE H SAFETY SPHERES**—Approximately fifteen times brighter than standard highway beads. For reflectorizing guard rails, curves, bridge abutments, safety islands, etc. Offer maximum reflectivity at lowest cost.
- **FLEX-O-LITE FREE-FLOWING TRAFFIC LINE BEAD DISPENSER**—New, simplified. Affords years of trouble-free operation. Ideal for municipal and highway use. Attaches to any traffic line paint machine. Satisfaction guaranteed.
- Ask about our Sign Bead Applicator.

Do your specifications demand **BIG SIX Performance?**

They should. Whatever the size of your city, Big Six Performance by the Gar Wood Load-Packer 600 will give you lower operating and maintenance costs, faster, more productive operation, years of extra service.

Big Six Performance represents advanced engineering features in the interest of efficiency and economy—features that work for you and your budget in these six important ways...

1. **FASTEST OPERATION**—Crew starts reloading in just 4 seconds... full cycle takes only 10 seconds. More speed means better service.
2. **GREATEST COMPACTION**—Direct thrust compaction packs more per yard than any competitive unit.
3. **BIGGEST LEGAL PAYLOADS**—Minimum dead weight. Front-mounted telescopic hoist eliminates the need for heavy, conventional hoist sub-frames. Result: less weight and greatly improved weight distribution.
4. **LARGEST, LOWEST HOPPER**—Big 1½ cubic yard, 74" wide hopper, plus low loading height speeds collection, makes crew's job easier. Three crewmen can load simultaneously.
5. **SAFEST, MOST DEPENDABLE OPERATION**—Controls are simple, foolproof. Operator



GAR WOOD PAX-ALL REFUSE CONTAINERS snap quickly on or off the Load-Packer 600 without use of chains or cables. Complete hydraulic operation is controlled with one lever.

has positive control, can stop mechanism instantly. Engineered for less maintenance with fewer moving parts, less linkage, fewer adjustments.

6. **GREATEST ECONOMY**—Big hopper, fastest loading cycle means less fuel consumption... less wear and tear on packer, chassis and engine.

The Load-Packer 600 is the economical answer to refuse collection in your city. Your Gar Wood - St. Paul truck equipment distributor can prove it to you.

Always specify Gar Wood...the most economical and efficient



GAR WOOD - ST. PAUL hoists and bodies deliver longer, dependable service with a minimum of maintenance. The rugged, precision hydraulic system handles controlled dumping smoothly, quickly, accurately... under the toughest conditions.



GAR WOOD - BUCKEYE wheel- and ladder-type ditchers offer modern features like these as standard equipment at no extra cost: hydraulic conveyor drive, hydraulic digging wheel hoist, modern power train and simplified group controls.



equipment you can buy!

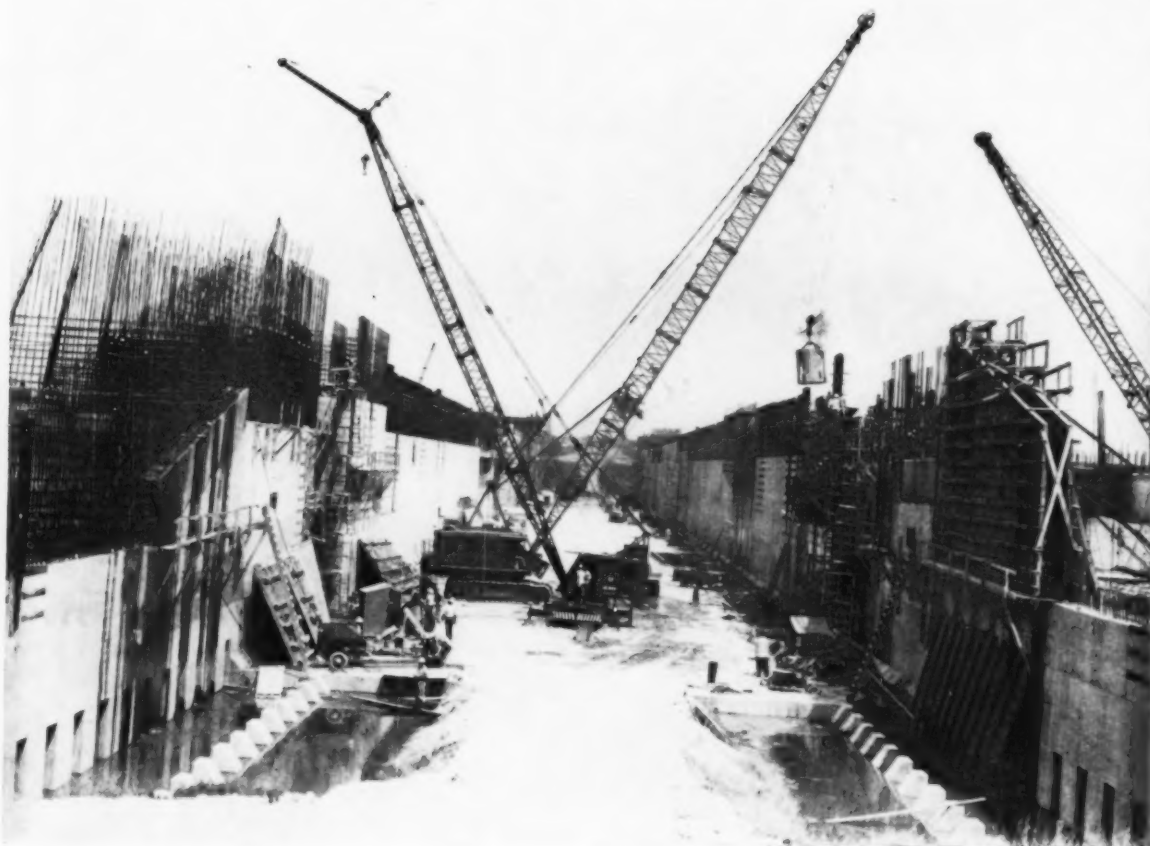


GarWood
INDUSTRIES, INC.

Wayne, Michigan

Plants in Wayne and Ypsilanti, Mich. • Findlay, Ohio
Mattoon, Ill. • Richmond, Calif. • Exeter, Penna.

GAR WOOD'S rugged $\frac{3}{4}$ yard machine gives you extra capacity for excavating and material handling. Independent travel lets operator hoist or swing while moving... built-in chain crowd puts full engine power into every bite, simplifies conversion.



giant sinews of LACLEDE STEEL add strength to the new Port Allen Locks



The Port Allen Locks in Louisiana will be an important link in the Mississippi River Freeway. With inland waterway traffic at an all time high, these locks will see plenty of action in the years ahead.

Strength and durability have been built into this massive concrete project with special large #18S Laclede Multi-Rib Round Reinforcing Bars.

General contractor for the new locks was T. L. James & Co., for the U.S. Corps of Engineers.

6027



LACLEDE

LACLEDE STEEL COMPANY

SAINT LOUIS, MISSOURI

Producers of Steel for Industry and Construction

Choice of transmissions

makes your **TL 14** just right...



5,300-LB CARRY CAPACITY • 1 TO 3-CU-YD BUCKETS

for all-out savings...TRACTOMATIC shift—If you play it close to the vest on short-haul loading or stockpiling, the Allis-Chalmers TL-14 with new, *low-cost TRACTOMATIC transmission* fits your needs . . . exactly. It gives you ease of operation at big savings. Operators pick the best working gear, then by just flipping a lever on the steering column, move forward or reverse. Because reverse speeds are 30 percent faster than forward, you automatically get extra back-away speed without going into a higher gear. The TL-14 with TRACTOMATIC gives you lower initial cost . . . lower upkeep . . . easier servicing . . . *all-out savings*.

for all-out production...FULL-POWER shift—If you want big production on long hauls or where jobs are scattered, then the TL-14 with *Full-Power Shift Transmission* is the machine for you. With just one lever, your operator shifts from any one gear to any other . . . forward or reverse . . . on-the-go. One lever controls both speed and direction. You boost production by taking the time and energy loss out of gear selection. It's easy for your operator to speed into a stockpile and quickly shift to low crowding gear for full-power loading.

move ahead with **ALLIS-CHALMERS**
...power for a growing world



ALLIS-CHALMERS

TL 14

GIVES YOU A BIG BONUS WITH...

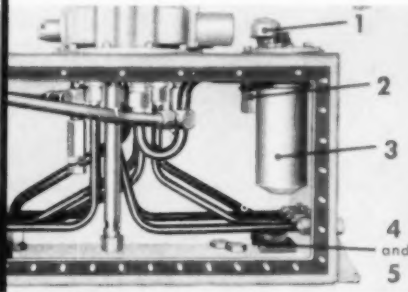
... center-of-truck dumping—

High 8-ft., 3½-in. dumping height combined with extra reach lets the TL-14 spot load right in the center of trucks. Lopsided loads... dozing to get loads even... and loading from two sides are eliminated. The TL-14 loads more material... more big trucks faster than other units of comparable size.



... five-way hydraulic protection

—Here's the only loader in its size range to offer complete hydraulic filtering protection. Air is double-filtered by: 1. air breather, 2. air filter... hydraulic oil is cleaned by, 3. full-flow micron filter, 4. conical screen, 5. magnetic filter. This kind of protection brings peak hydraulic operating efficiency... extended hydraulic service life.



... safe dump cylinder location

—Instead of mounting dump cylinders on the bucket, Allis-Chalmers puts them up and away from abrasives that can score piston rods... damage hydraulic components. This dump cylinder location provides better loader stability... less weight to be lifted with bucket... fewer wearing parts.



Let your Allis-Chalmers dealer demonstrate the TL-14 on your job. He can also tell you about other Allis-Chalmers tractor loader models—ranging in capacity from 1 to 5 cu yd. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

move ahead with

ALLIS-CHALMERS



... power for a growing world



You can thank Johns-Manville's patented Ring-Tite® Joint which cuts ground water infiltration to a minimum. It's exclusive on *Transite®*, the white sewer pipe.

On a recent sewer project, specifications called for an extremely exacting infiltration test. What was the outcome? At final inspection, infiltration in the *Transite* line was 80% less than specification. What does this mean? Important savings! Volume of sewage to be treated is kept to a minimum . . . treatment plant operates as designed. The plant's reserve is conserved for future service.

Transite, made of tough, durable asbestos and cement, with its tight joints, offers many other savings. The long, light-weight lengths and sure coupling methods reduce trenching and installation costs. *Transite*'s low coefficient of friction means faster flow and shallower trenches. Preventive maintenance with *Transite* will save you thousands of dollars.

Take it from Hartley—*Transite* can provide important economies in all sewer projects. Get all the details on *Transite*, the white sewer pipe. Send for your facts and data book today! Write Johns-Manville, Box 14, PW-1, New York 16, N. Y. In Canada: Port Credit, Ontario.



JOHNS-MANVILLE
TRANSITE PIPE





RIGID No. 205 Tubing Cutter

Time-Saving, Slide-to-Size $\frac{1}{8}$ " to $2\frac{3}{8}$ " O.D. Capacity

Made of lightweight, high-strength cast aluminum alloy, you'll find these new RIGID Tubing Cutters extra handy. Slight push on handle of large-size-range RIGID No. 205 snugs cutter wheel against tubing . . . locks it in position until released. Feed screw fully protected and enclosed . . . always feeds into tube with easy handle turn . . . can't jam with chips or dirt. Wheel gives quick, clean cuts of copper, brass, aluminum tubing and thin-wall conduit . . . no burr. Grooved rollers give easy flare cut-offs without tubing waste. Tubing always turns freely on 2 of 4 Rollers. Rollers smooth tubing ready for soldering. Fold-in reamer always handy. Spare Cutter wheel in handle. Wheel for plastic and aluminum pipe available for No. 205 only.

Conform to Fed. Spec. GGG-C-771b Type II—Class I—enclosed feed mechanism

RIGID No. 105 Tubing Cutter



Protected Feed Screw
Always Easy-Turning
 $\frac{1}{8}$ " to $1\frac{1}{8}$ " O.D. Capacity

To save time and tubing, order these new RIGID Tubing Cutters today! Your Supply House has them!

RIGID

The Rigid Tool Company • Akron, Ohio, U.S.A.

Ed Cleary Says:

EMBARGO ON SEWER CONSTRUCTION MOVES DELINQUENT CITIES

EDWARD J. CLEARY

Diplomate, American Academy of Sanitary Engineering
Cincinnati, Ohio

WATER pollution control agencies are making greater use of a potent means to deal with municipalities which have shown little disposition to install sewage-treatment facilities. They are simply denying approval of applications for extension of sewers "until adequate treatment facilities are provided or assured." And since it is illegal under many state health laws to make additions to a sewer system without prior approval, the refusal of a permit can place a municipality in a very unhappy position.

Some states have already applied—or are threatening to apply—an embargo on sewer construction in cases where municipalities have shown no tangible progress in providing sewage-treatment facilities. The theory is that a community already causing stream pollution cannot in good conscience be permitted to create further pollution that would result from the extension of sewer service.

Most recent application of an embargo has occurred in Kansas City. Here the Missouri State Water Pollution Control Board has told the city that no new sewers can be installed unless voters approve a sewage-treatment construction program on November 3, or the City Council acts immediately to levy assessments for plant construction.

Last November the Pennsylvania Sanitary Water Board refused to act on a sewer-permit application from the town of Jeannette. The board had been waiting since 1944 for the town to comply with orders to rehabilitate an inadequate treatment plant. More recently the Borough of Monroeville was told by the Pennsylvania authorities that it could build no sewers to serve new subdivisions until the community carried through on its promise to connect with the regional treatment works now being operated by the Allegheny County Sanitary Authority.

Successful Use in Illinois

Use of the sewer-extension embargo in promoting action from recalcitrant communities should claim much wider application than it has had, in the opinion of some administrators. As far back as 1949 this view was advanced to the eight states that comprise the Ohio River Valley Water Sanitation Commission. Clarence W. Klassen, a member of the Commission and technical secretary of the Illinois Sanitary Water Board, related how his board used this device with great success.

Among other things, Mr. Klassen told of a community that had for years been dodging its responsibility to curb stream pollution. One day the city formally requested a sewer-extension permit to serve

**SOME OF THE FINEST
COMMUNITIES IN THE
UNITED STATES
HAVE INSTALLED**

F&E *multi-cell
Incinerator Stokers*

THERE MUST BE A REASON!

- *Complete flexibility
of operation*
- *Utmost in economy
—reduced labor*
- *Rugged construction
—lifetime dependability*
- *Progressive burning
for maximum results*

Chicago, Ill., 1920 tons - Detroit, Mich., 2860 tons - Boston,
Mass., 900 tons - Cleveland, Ohio, 1400 tons - Washington, D. C.,
1000 tons - St. Louis, Mo., 1000 tons - Baltimore, Md., 1400 tons - New
Orleans, La., 800 tons - Oyster Bay, N. Y., 500 tons - Cincinnati, Ohio,
400 tons - Columbus, Ohio, 541 tons - Stamford, Conn., 375 tons - Milwaukee,
Wis., 300 tons -



Omaha, Neb., 375 tons -
Rochester, N. Y., 200 tons -
Alexandria, Va., 200 tons -

E. Hartford, Conn., 200 tons -
White Plains, N. Y., 400 tons
... and many, many more.

*F&E Multi-Cell Incinerator Stoker
installations represent a tonnage of
over 20,000 tons daily.*



FLYNN & EMRICH

BALTIMORE 2, MARYLAND

**PROVED IN USE FOR SUPERIOR QUALITY,
DEPENDABILITY AND SAFETY...**

Whether you count the hours, the days, or the years, world-wide industry has counted on NORWALK as the reliable source of compressors that fulfill every specification: from single stage to six stages; from 125 to 42,000 PSI pressure; for a full range of gases: Acetylene, Air, Argon, Specific Hydro Carbons, CO and CO₂, Ethane, Ethylene, HCL, Helium, Hydrogen, Nitrogen, Nitrous Oxide, Oxygen.

NORWALK

HIGH
PRESSURE

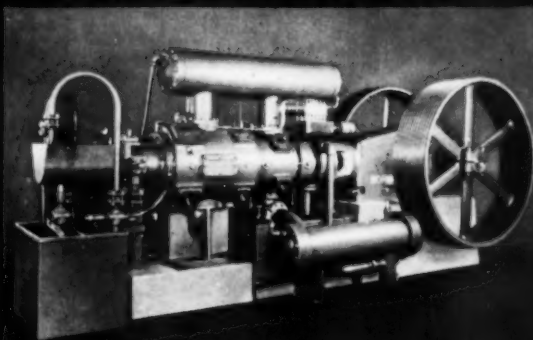
AIR
and GAS

COMPRESSORS

ALMOST

100 YEARS

**CONTINUOUS SERVICE
CUSTOM FABRICATING
THE WORLD'S FINEST
COMPRESSORS FOR
EVERY INDUSTRY...
FOR EVERY PURPOSE.**



Phone TEmple 8-4766 in South Norwalk
for immediate consultation of your inquiry.
Write, for informative, descriptive Catalog 1960.

NORWALK

COMPANY, INC.
SOUTH NORWALK, CONNECTICUT

COMPRESSOR SPECIALISTS TO WORLD WIDE INDUSTRY SINCE 1864

a proposed multi-million dollar federal hospital. Asserting that this would create more pollution and thus make a bad situation worse, the Illinois state board refused to sanction sewer extensions until the city submitted a financing and construction schedule for treatment facilities. And to add to the discomfiture of the municipal officials, the board notified federal authorities that the city was in no position to render sewer service until it complied with state law. The case was settled to everybody's satisfaction by building both the sewage plant and the hospital, said Mr. Klassen.

Authority for Denial

One of the Ohio Valley compact signatories—the Commonwealth of Kentucky—incorporated the sewer-embargo feature in its new water pollution law adopted in 1950. The provision of the Kentucky act relating to this reads as follows: "It shall be unlawful for any person to construct or install a disposal system, or to make any change in, addition to or extension of any existing disposal system, or to operate any such new or existing system so changed, added to, or extended, without first obtaining from the Commission approval of the plans and specifications therefor and a written permit for its construction and operation."

It should be added that the Kentucky law defines disposal system as "a system for disposing of sewage, industrial wastes, or other wastes, and includes sewer systems and treatment works."

In the "Suggested State Water Pollution Control Act", published in 1950 by the U. S. Public Health Service and endorsed by the Council of State Governments, it is recommended that a state control agency be empowered: "To issue, continue in effect, revoke, modify or deny, under such conditions as it may prescribe, to prevent, control or abate pollution, permits for the discharge of wastes into waters of the State and for the installation, modification or operation of disposal systems or any parts thereof." A disposal system is defined in the act as "a system for disposing of wastes and includes sewerage systems and treatment works."

Recognition of the virtues of the sewer embargo has found expression in a policy adopted by the eight states of the Ohio Valley Compact. Noting that municipalities who have failed to install sewage-treatment facilities can create additional pollution by the connection of new sewers, the signatory states formally resolved that permits for the extension of sewers will be issued only when "adequate treatment facilities exist or are definitely assured within a time satisfactory to the state."

Quite recently, when the Ohio Valley Commission was requested by West Virginia to intervene and apply interstate compulsions in speeding up completion of treatment facilities at Huntington, W. Va., the placing of a ban on new sewer construction was under consideration. When the city revised its financing and construction schedule to meet interstate requirements, imposition of the sewer embargo was held in abeyance.

Why the Plan Works

Among the reasons why a restriction on sewer extensions has proven so effective is that it creates a whole series of pressures on the city. Bonding attorneys, for example, are unlikely to give a favorable opinion on the salability of bonds for sewer construction since they would be issued under a cloud

Hydro E-Z Packs help win 3 new municipal contracts



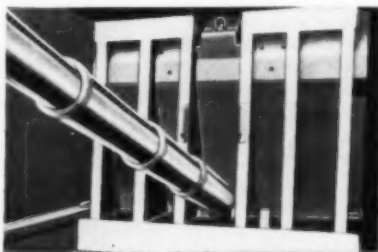
ADAM SCHLEINING,
President, Santa Ana
Commercial Co., Inc.

"We're saving at least \$13,760 monthly with 32 Hydro E-Z Packs"—

In Santa Ana, Calif., Adam Schleining, President, Santa Ana Commercial Co., Inc., reports, "Our fleet of 32 Hydro E-Z Packs is saving us at least \$13,760 monthly compared with the costs of operating open trucks. We are handling about 10% greater volume with half the number of trucks and men, even though our former equipment was self-packing." Mr. Schleining figures that E-Z Packs save two 40-minute dump trips daily

per unit. And since one man with one E-Z Pack averages 375 pickups daily, efficiency is up 110% over trucks with 3-man crews.

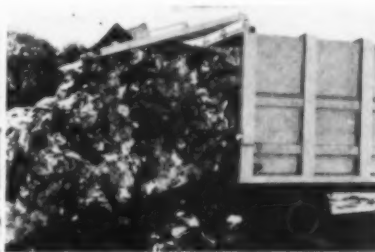
"With this efficiency, we have won 3 new municipal contracts in 2 years on low competitive bids," Mr. Schleining said. For the full story see your Hydro E-Z Pack distributor or write us for a free copy of "The Big Squeeze."



76,600 lb. maximum pressure is applied by telescopic cylinder. E-Z Pack is world's most powerful refuse compactor.



One-piece door with strong box section framing absorbs compaction force, keeps its shape. Body stays watertight.



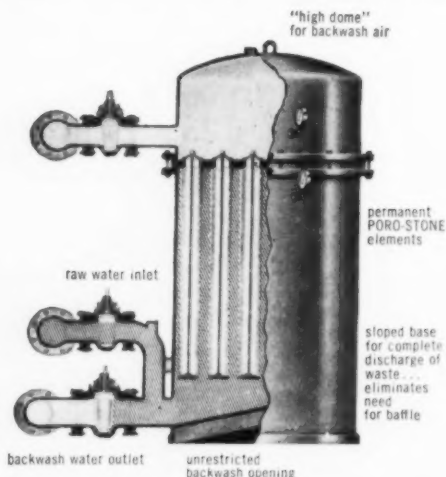
No hoisting! No chains or weights needed to hold down front end. The same blade that compacts refuse discharges fully packed load.



HYDRO E-Z PACK®

HYDRO E-Z PACK DIVISION OF HERCULES GALION PRODUCTS, INC., GALION, OHIO

© 1960 HOWARD SWINE



"HIGH-POLISH" FILTRATION

For Standby or Emergency— Adams Diatomite Filters

Adams IWF Diatomite Filters are delivering "high-polish" water with major economies and complete freedom from troubles, in an increasing number of municipal systems. Some installations are for standby duty during lengthy periods when sand filter beds are being cleaned. Others provide additional capacity for peak loads during seasons when an auxiliary source of high turbidity must be tapped.

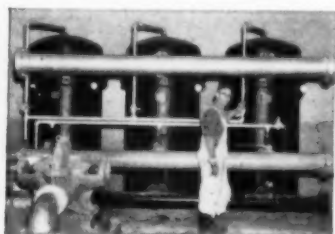
Still other systems utilize Adams Filters on the effluent line of their sand filters. The latter remove the coarser particles, while the Adams Filters remove the bacteria, nematodes and other microscopic particles which sand cannot trap.

Many smaller community systems utilize Adams "high-polish" filtration exclusively, obtaining a clarity of water that delights consumers.

Other advantages you will enjoy in Adams Filters are:

1. Compact size, requiring only a fraction of the installed space of sand filters.
2. May be installed at half the price of sand filters.
3. Simplicity of piping and installation.
4. Rugged, permanent Poro-Stone filter elements.
5. Long filtration cycles through continuous filter aid feed.
6. Backwashing that really cleans the filter by the Adams efficient "Pressure Dome" system.

Send us your problems today.



This Adams plant at Peru, N. Y., installed for emergency service, proved so satisfactory that it is now used continuously, year-round.

R. P. ADAMS CO., INC.

228 EAST PARK DRIVE • BUFFALO 17, NEW YORK

of illegality; and no municipal financial officer would consider it prudent to authorize release of city money for illegal installation of sewers. Furthermore, a consulting engineer could hardly afford to be identified with construction work that had not been sanctioned by the state since this could be made cause for revocation of a professional license.

And finally, every real-estate developer or builder whose completion of a project depended on the installation of sewers would be on the necks of the city administration to have the embargo lifted.

Thus, by the simple process of denying a sewer permit the burden of compliance with state anti-pollution regulations is placed exactly where it belongs—on the polluter. And the state administrator of a clean-streams program is in a strategic position to carry out his task of enforcement.

To frustrated administrators the application of powers of denial for sewer extensions could open a new era in securing action on treatment works. And it should be comforting to those cities who have already met their responsibilities to know that others will not continue to escape the common obligation of preventing stream pollution.

• • •

Water Management For Permanent Mosquito Control

IN NEW JERSEY, water management forms the basis of permanent mosquito control. This may take the form of a ditching installation for surface drainage; the installation of ditches on the salt marshes for tidal circulation and for the distribution of mosquito-eating fish; the installation of dikes, tide gates or even pumps to drain polluted marshes; the impoundment of water on marsh areas; the construction of ponds or lakes in low, poorly drained marsh areas utilizing the spoil for fill; or a combination of one or more of the mentioned methods.

In counties supporting mosquito extermination commissions, the establishment of permanent controls usually becomes one of their normal functions, and local boards of health assume a supporting position.

In counties not supporting mosquito extermination commissions, a board of health may, under special circumstances, engage in a permanent mosquito control project. The following memorandum was prepared for guidance in planning and executing such works and was published in *New Jersey Public Health News*. Local boards of health supporting existing county mosquito extermination commissions will find the information helpful in appraising the many factors involved in water management for mosquito control.

The steps leading to the decision to apply water management techniques for mosquito control are generally as follows:

1. Fixing the sources of mosquito production by entomological survey. This survey should determine the species of mosquitoes typical to each breeding place, the breeding potential and its effect on the control area.
2. The determination of the most economical and effective method to secure the control of mosquito breeding in each source. This requires preliminary surveys, both entomological and engineering, to establish costs and relative efficiencies of controls by water management of chemicals.



With a $\frac{3}{8}$ -yd. dragline bucket, BANTAM T-350 cleans out ditches alongside streets in Minden, La. High-speed production (up to 115 yds. per hr.) makes quick work of the job, lets Minden move its BANTAM on to other chores with savings in time and money.

City superintendent says:

"BANTAM is the best machine available for city work"

"We do anything we have to do with our BANTAM," reports Superintendent R. K. Whitlock of the Minden, Louisiana, Street and Water Dept.

Minden uses its BANTAM on all kinds of jobs—cleaning out drainage ditches after heavy rains, loading gravel and sand for street maintenance, etc. "BANTAM is mobile and fast—and much more productive," says Mr. Whitlock. "I'd recommend BANTAM to any city that wants efficient, low-cost equipment. It's the best machine available for city work."

BANTAM IS A REAL "BUDGET-SAVER"

BANTAM T-350 is the most practical tool for handling jobs all over town: sewer and water line extensions and repairs, drainage ditches, culvert work, street and alley repairs, sanitary landfill projects. It's tops for all excavating work, materials-handling or speeding

municipal building projects. As Superintendent Whitlock puts it, "BANTAM is as handy as a pocket on a shirt!"

Practical-sized BANTAM travels and works easily even in congested areas. BANTAM's big-rig features, 11-ton capacity and exclusive engineering advantages assure high speed, dependability and low operating cost.

11-ATTACHMENT VERSATILITY

With its 11 quick-change attachments, BANTAM is ready to work anywhere. And more than 25 optional features enable you to buy your BANTAM exactly as you want, to fit your specific job needs.

Let us prove to you why BANTAM is the most useful all-around rig you can own—the best investment for cities, towns and counties.



Here's another of three BANTAM models tailor-made for all kinds of city work—self-propelled BANTAM CR-350, with back hoe, prepares new subdivision streets for curb and gutter installation. One-man, one-engine operation; 11-ton capacity, automotive power steering; independent travel, swing and hoist, and new, higher travel speeds make the CR-350 a real saver for tight-pinched budgets. See the crawler mounted BANTAM C-350, too.

PW-284



301 Park Street, Waverly, Iowa

World's largest producer of truck crane-excavators

HOW TO BUY THE BEST CHIPPER FOR YOUR NEEDS

1 Ask for a Free Demonstration. Your dealer will gladly demonstrate the new 1960 Asplundh... will even run it side-by-side with any other chipper to let you compare machines and results.

2 Look for the features that give you these benefits.

Chipping Speed. By actual test Asplundh is the fastest chipper made—which your dealer will gladly prove.

Low maintenance cost. The Asplundh has fewer moving parts. This means lower maintenance, less down time.

Safety to workers and passers-by. Asplundh blades are tapered and wedged—cannot fly out.

Ease of operation. Unskilled labor can operate the Asplundh with ease—change blades quickly.

Highway safety. Asplundh's underslung engine and axle place the center of gravity low for safe, true highway tracking.

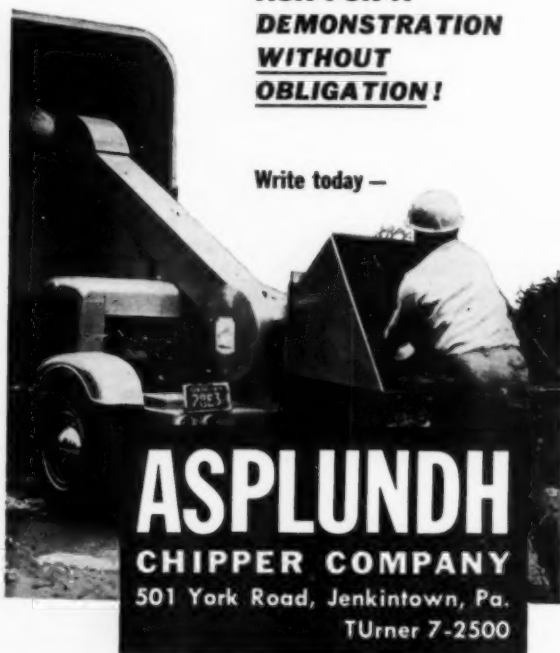
Big capacity. Asplundh chips all you can feed it—limbs up to 6" diameter—hour after hour, day after day.

3 See for yourself why Asplundh outsells all other makes. Write for new brochure of testimonials from satisfied users.

SEE US AT BOOTH #C-14, NEW YORK EXHIBIT

**ASK FOR A
DEMONSTRATION
WITHOUT
OBLIGATION!**

Write today —



ASPLUNDH
CHIPPER COMPANY
501 York Road, Jenkintown, Pa.
TUrner 7-2500

Proven in service by the world's largest tree company

3. When water management appears to be the only effective method, then the following steps should be taken:

a. Secure positive determination of mosquito breeding.

b. Determine ownership of the lands involved:

1) When publicly owned, conferences with the governing body will usually develop a permanent control method most suitable to the locality, such as, filling for park or recreational purposes, development of park ponds, sanitary landfill or drainage pending more permanent land utilization. Consultation with conservation interests is recommended.

2) When privately owned, an abatement notice should be served giving the owner a reasonable time to effect a control. The usual policy is to expend public funds for the control of natural breeding areas and require the owner to abate, at his own expense, artificially created breeding places. Here good judgment is important and the public interests should be properly evaluated.

3) In the design of mosquito control by water management methods, should the local board of health proceed to abate, considerations should be given to the following requirements:

a) The controls should not be so extensive as to improve the value of private lands at public expense. In short, drainage should be designed to remove surface waters, not to develop farm lands.

b) As the local board would be held liable for damage to private property not essential to the abatement of the nuisance, great care must be exercised not to over design the project or to create flood damage downstream. The State Department of Conservation and Economic Development should be consulted on any project that involves the material change of any stream on the State topographical maps or should the project involve wildlife.

c) The planning and supervision of such projects should be under the control of a properly qualified and experienced specialist.

d) In New Jersey, the New Jersey Agricultural Experiment Station at Rutgers University is legally required to supply information to local boards of health concerning the nature and results of mosquito extermination.

Use of Consulting Engineers By County Highway Departments

In a questionnaire sent to County Engineers, the question was asked: "Do you retain consultants for highway planning and construction?" About 600 replies were received. A tabulation of 293 counties from Alabama through Michigan showed that 82 counties employed consultants; 171 did not; and 40 used them for special projects, as bridges, or from time to time. Greatest use was reported by Illinois, Kansas and Michigan.

Itemized Costs of Sewage Treatment

The Riverside sewage treatment plant, Fort Worth, Texas, treated an average of 31.3 mgd in 1959 fiscal year. The cost was \$15.99 per mg treated, which was divided as follows: Salaries \$9.66; supplies 35 cents; maintenance, buildings \$1.53 and equipment 42 cents; miscellaneous services \$3.12; replacement equipment 3 cents; capital outlay equipment 22 cents; and other costs 66 cents. For each million gallons of sewage treated 264 kwh of electricity were used.

NEW CATALOG Describes Latest Developments in Waste and Refuse Storage and Removal



New Techniques Cut Cubic Yard Removal Costs to Record Low

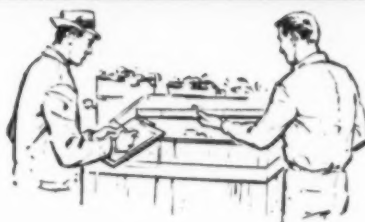
This new 28-page color catalog describes remarkable new developments in waste control and disposal that have, within the last two years, obsoleted many systems now in use. Cubic yard handling costs have been reduced to a point where many firms and municipalities are saving thousands of dollars annually that they were previously spending to operate old-style equipment.

Materials handling and waste disposal are two of the few areas of large potential cost reduction remaining in manufacturing and municipal administration. This new catalog has a bearing on both of these areas of operation.

To get your copy of this new fact-filled catalog, write today.

DEMPSTER BROTHERS
Inc.

DEPT. PW-8, KNOXVILLE 17, TENN.



FREE SURVEY WITHOUT OBLIGATION

Dempster Field Engineers, located in all sections of the country, make thousands of cost-finding refuse storage and collection surveys every year, without cost or obligation. If you would like to know your disposal costs, and what—if any—avenues of improvement exist, write today on your letterhead.

28 Page Catalog FREE	Dempster Brothers, Dept. PW-8 Knoxville 17, Tennessee	
	Please Send New Catalog Brief 160	
	Name _____	
	Title _____	
	Firm _____	
	Address _____	
	City _____	State _____

SAVE ON PATCHING

with Wylie's new Patch-Mix . . .
lowest cost complete plant ever built

Designed especially for small municipalities. Compact and easy to handle . . . with big plant features such as rotary dryer, pugmill, built-in asphalt tank, volumetric metering system. A self-contained unit on two-wheel trailer. The Wylie Patch-Mix produces all types hot mixes as well as cold mix. Features never before available at such low cost.

Write today for FREE brochure describing exclusive features, price information, and name of nearest dealer.

**Model PM-310
PATCH•MIX**



WYLIE MANUFACTURING CO., INC.
P. O. BOX 7084 • OKLAHOMA CITY 13, OKLA.



the chain that
pays for itself . . .

BISON ALUMINUM CHAIN eliminates maintenance costs

This durable aluminum chain cannot corrode. By eliminating the average periodic scraping, painting and replacement required by ordinary chain, you save the original low cost of Bison Aluminum Chain in two years or less.

Adds lasting beauty to your landscape plans and forms protective safety barriers for roads, parking lots and work areas.

Ideal for exterior applications such as the installation shown above or for interior guard rails.

Links and fittings available in many sizes. Write today for specification folder, price list and sample links.

BISON ALUMINUM CHAIN CO., INC.
249 Hertel Ave., Dept. C-P • Buffalo 7, N. Y.



BOOKS IN BRIEF

SEWER MAINTENANCE

This Manual of Practice No. 7 of the Water Pollution Control Federation has a basic aim—to present procedures and practices which will establish the sewer system as an effective public utility. Among the subjects treated are methods of organizing personnel for maintenance in large, medium and small-sized cities; maps and other records; building and plumbing permits; equipment yards and shops; customized mobile equipment; portable compressors, pumps, generators, chlorinators and radio telephones; accepted practices in sewer cleaning and preventive maintenance; causes of sewer failure; maintenance of pumping stations; accounting practices; safety procedures; public relations; and specific maintenance problems arising from faulty design. Information is presented on photographing sewers and the use of closed circuit television for inspection. A sample sewer maintenance record form, complaint record form, typical page from a map book and a layout of a maintenance equipment yard are among the more valuable illustrations. The manual contains 64 pages, is cloth bound and may be obtained from the Water Pollution Control Federation, 4435 Wisconsin Ave., NW, Washington 16, D. C. The price to members of the Federation is \$1.00; to non-members, \$1.50.

CONSULTING ENGINEERING

A manual of recommended principles for consulting engineers assembles in one volume a series of practical guides to the performance of consulting engineering practice. The text is divided into seven sections which include, in addition to client relationships, data on the nature and extent of consulting services; handling bids; "free" engineering; definitions and descriptions of all parts of a contract, with samples of forms used; organization and operation data; fees; insurance; accounting; and operating expense disbursements. A code of

ethics is an important part of the text. The text was prepared by a committee headed by Thomas R. Miles and including Lloyd K. Clark; Holly Cornell; Donald Kroeker; Harry Czyzewski; and Joe Williamson, Jr. 200 pages. Consulting Engineers Council, Springfield, Illinois.

ELEMENTARY ENGINEERING MECHANICS

This book is designed specifically to fill the need for two-year technician training programs. While covering all the essential elements of statics and dynamics and their application to engineering problems, it employs an effective simplified approach. The book assumes a knowledge of plane geometry and high-school algebra plus the ability to learn and use trigonometry, which is introduced, with explanations, in the text. Part 1 of the book deals with statics; part 2 with dynamics or moving bodies. By E. G. Key, Prof. of Engineering, East Los Angeles College, San Gabriel, Calif. 452 pages, illustrated. John Wiley & Sons, Inc., 440 Fourth Ave., New York. \$5.50.

PARKING AND TRAFFIC SURVEYS

The Hollywood Plan is a guide for conducting parking and traffic surveys for cities of less than 35,000 population. Tried and tested procedures are used to provide accurate data. There are 22 working drawings showing how traffic counts are used, how to determine needs and to measure street parking; and when is the best time to do the work. By Neno Spagna, Planning Director, City Administration Center, Hollywood, Fla. 42 pages; price \$1.50

MUNICIPAL STREET TREES

The subtitle of this book is "A Manual for Public Officials and Municipal Foresters." Part 1 discusses municipal regulation and control, including establishing a tree program, scope of such a program and its administration and financing. A model ordinance is suggested, as are regulations for permits and licenses. Part II includes information for foresters, including factors governing selection of trees for streets, planting practices, water, fertilization, pruning and insect control and spraying. A list of sources of additional information is appended. 57 pages \$3. League of Wisconsin Municipalities, 30 East Johnson St., Madison 3, Wisc.

PUBLIC WORKS for August, 1960

San Francisco
scores a homer with
Candlestick Park,
America's
newest
stadium



YOU CAN BE SURE...IF IT'S Westinghouse

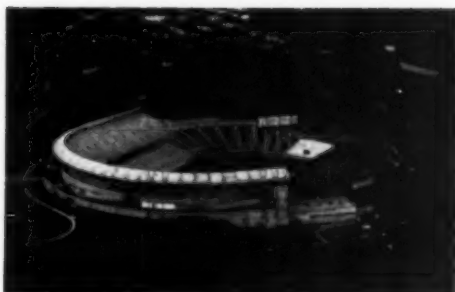
America's newest baseball arena is lit at night for maximum "playability" with 1147 Westinghouse Type VRC-20 1500-watt floodlights. The precise aiming of the lights was under the direction of Westinghouse Lighting Sales Engineer Reed Hansen, (*below*), and they are designed to burn at over-voltage increasing their normal candle power 37 percent. This means that players under most conditions enjoy visibility as good as daylight gives without the glare and shadows that frequently plague them on sunny afternoons.

Westinghouse floodlighting system maintains IES standards of intensity for playing areas. The striking design of the wind baffle tops massive concrete stadium. Two of the eight floodlighting towers that are spaced around perimeter of stadium are shown here.



J-94143-2





Giants' new home is Powered-Up for maximum nighttime "playability"

San Francisco's Giants racked up a 3 to 1 victory to open their season and inaugurate their new home in the West, Candlestick Park—one of the finest baseball stadiums in America.

Candlestick Park is a massive concrete structure that has an air of being weightless and soaring. Utilizing precast and prestressed beams and supports, the stadium consists of two tiers of seats (some radiant heated) that provide maximum "seeability" for 45,000 fans—with the upper deck topped by a unique wind baffle. To challenge the teams, foul lines extend 335 feet, and it's 420 feet straight from home plate to the fence. A giant scoreboard not only keeps tabs on the game in progress but also on action in both major leagues. A press, radio and loge-seat mezzanine, dress-

ing rooms, refreshment areas and an 8700-car parking lot complete the impressive installation.

The careful attention applied to the architectural design and construction extends to the electrical distribution system serving the stadium. To give the field maximum "playability" at night, 1147 1500-watt Westinghouse floodlights make this one of the best-lighted baseball diamonds in the country. Included in the electrical system are eight power centers (one for each lighting tower), master lighting control panel, individual lighting panelboards, dry-type transformer, motor

(cont.)

YOU CAN BE SURE...IF IT'S **Westinghouse**

J-94143-3



Checking scale model of Candlestick Park are Lyle E. Patton, Consulting Electrical Engineer; John S. Bolles, Architect; Walter A. Haas, President of the San Francisco Recreation and Park Commission; and Raymond S. Kimbell, General Manager of the San Francisco Park Department.



Economical power distribution for Candlestick Park was achieved with eight Westinghouse unitized power centers of 750- to 225-kva ratings, each having plenty of expansion room. Each power center steps 12-kva primary power down to 120/208 volts to serve lights and electrical equipment. Inspecting one center: M. P. Buswell, Westinghouse Area Sales Manager; C. L. Harney, General Contractor; and L. E. Patton.



Motor control and protection are afforded by the Westinghouse motor control center under examination by H. G. Dechene of Brayer Electric; L. E. Patton; and D. G. Hartman, Westinghouse Sales Engineer. Such control centers group all controls together in interchangeable, space-saving, easily installed modular units. Starter units control and protect motors for air distribution units from centralized location.



Lighting for concourse and corridors is controlled and protected by Type NLAB panelboards located around stadium. Relays and control switches installed in this panel allow remote operation from centralized point. Seen examining this attractive flush mounted panelboard in stadium concourse are H. G. Dechene and G. R. Brayer of Brayer Electric Co.; and Spence Pors, Westinghouse Distributor Salesman.

Giants' new home (cont.)

control center, air handling equipment and motors. All are Westinghouse products, chosen for their ability to provide dependable, uninterrupted service. Careful attention to future uses for the stadium produced an electrical system capable of expansion. For example, the field lighting and related power supply equipment can be easily enlarged to provide the extra illumination required for nighttime football games. For information about how the Westinghouse products that Powered-Up Candlestick Park can meet your electrical needs, call your nearby Westinghouse Electrical Construction Engineer. Or write, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

OWNER: San Francisco Stadium Inc., for City and County of San Francisco

ARCHITECT-ENGINEER: John S. Bolles, San Francisco
E. Elmore Hutchison, San Francisco

CONSULTING ELECTRICAL ENGINEER: Lyle E. Patton, San Francisco

GENERAL CONTRACTOR: Chas. L. Harney, Inc., San Francisco

ELECTRICAL CONTRACTOR: Brayer Electric Co., San Francisco

WESTINGHOUSE DISTRIBUTOR: Westinghouse Electric Supply Co.,
San Francisco

J-94143-4

YOU CAN BE SURE...IF IT'S **Westinghouse**



Comfortable heating for Giants' locker room and clubhouse area is provided by Type AH horizontal air distribution unit, one of four in Candlestick Park. The inherent design of stadium construction, with widely separated points of heating demand, is an excellent application of Sturtevant air handling equipment.

Tough, durable Micarta® is ideal surfacing for Candlestick Park's refreshment counters. This hard-working plastic surface is immune to scuffs, knocks, hot liquids and rough treatment . . . is easily cleaned, never needs refinishing. Shown are Tom Morse, U. S. Plywood Salesman; Joe M. Moore, Cabinetmaker; and Bill Lyle, Westinghouse Micarta Salesman, examining Micarta counter top.





CITY OF CHARLOTTE, NORTH CAROLINA recently built a new road to its sanitary land fill area. Compaction of the road base was handled by this Huber-Warco 10-ton 3-wheel roller, one of three owned by the city.



HUBER-WARCO

3 wheel rollers

SIZES FROM 10 to 14 TON

Huber-Warco 3-wheel rollers are made in General Purpose, Finishing, and Variable Weight models to fit every 3-wheel roller need.

TORQUE CONVERTER tailshaft governor and two speed transmission are standard. Doubles available power, cuts fuel costs, increases life of machine components one-third to one-half.

SPECIAL SUB FRAME suspended at three points carries engine and transmission assembly

and cushions outside shocks to increase machinery life.

GUIDE ROLL assembly has tapered roller bearings and is completely adjustable. Retains factory new adjustment indefinitely. Kingpin housing is removable.

OTHER FEATURES include replaceable tire design, differential lock, variable speed hydraulic steering, pressure sprinkling system, choice of gasoline or diesel engines.

A trusted product name backed by respected distributor names from coast to coast



MOTOR GRADERS

Standard transmission models from 83 to 160 H.P.
Torque converter and power shift transmission models from 102 to 195 H.P.



TANDEM ROLLERS

3-5 Ton • 4-6 Ton
Retractable • 5-8 Ton • 8-10 Ton • 8-12 Ton • 10-14 Ton



3-WHEEL ROLLERS

10-Ton • 12-Ton • 14-Ton Standard Weight
10-12 Ton • 12-14 Ton Variable Weight



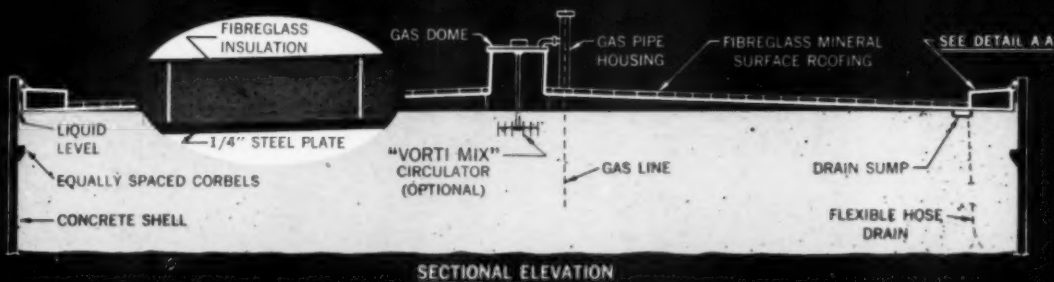
MAINTAINER

M-52 — 45½ H.P.
Attachments are Lift-Loader, Broom, Bulldozer, Patch Roller, Scarifier, Snow Plow, Berm Leveler

HUBER-WARCO COMPANY

Marion, Ohio, U.S.A.

New MONODECK* floating cover



SECTIONAL ELEVATION



**cuts costs—incorporates
improved structural and operating features**

By exclusive arrangement with General American Transportation Corporation, INFILCO offers the "MONODECK" floating cover for sludge digesters in a full range of sizes. This cover, designed by Wiggins, offers the same basic structural features which have been incorporated in the 214 foot diameter gas holder for the City of Long Beach, California. The essential features and advantages of the "MONODECK" type cover are:

1. It is a statically determinate structure in which the weighted pontoon is a structural member designed for torsion, bending and compression.
2. Its design is simple. Rectangular plates are field welded into a single deck to which a protected insulation is directly applied. The pontoon structure with single roller guide banishes possible side thrust on the tank wall.
3. The "plate and pontoon" design minimizes tip and makes submergence impossible.

4. Up to 60 feet in diameter, the "MONODECK" cover can be assembled complete outside the tank and lifted by the contractor's crane into position. Tank and cover can, therefore, be constructed simultaneously. Savings in erection costs may be as much as 50% on the larger covers.

5. The elimination of trusses between cover and roof removes the explosion hazard and reduces the dead load to 15 pounds per sq. ft.

**PROMPT DELIVERY AT LOW FREIGHT COSTS.
FROM SOURCES IN EASTERN, MID-WESTERN,
SOUTHERN, MOUNTAIN AND WESTERN STATES.**

**For more complete information, write
today for bulletin 6723**



6041

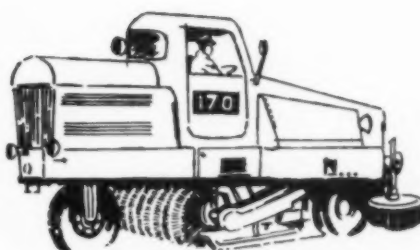
INFILCO, INC.
General Offices:
TUCSON, ARIZONA
Field offices throughout
the United States and in
foreign countries

*TRADEMARK



PERMENE

EXTENDS SWEEPING MILEAGE — CUTS BROOM COSTS



O-Cedar Permene is exclusively engineered for rotary street sweeping equipment. Permene may be wound by hand or on fully automatic winding equipment. Actual field tests have proved that Permene outwears natural fibres from 6 to 10 times. Longer wearing properties make it unnecessary to rewind brooms as often—cutting fibre cost, labor cost, and machine down time. Permene is easy to handle—rewinding is done quickly.

Permene gives superior sweeping action over natural fibres—it insures the pick up of more dirt including heavy debris. Permene fibre does not become limp or matted when wet—can be used effectively in rain or light snow.

Permene has been proven very satisfactory for use on both military and commercial airport landing strips and parking ramps.

Visit Booths A-49 A-50
Public Works Congress & Equipment Show
New York Coliseum—August 14-17, 1960



N-ZYME — AIDS

MUNICIPAL SEWAGE PROBLEMS



O-Cedar N-Zyme has a basic formula of preserved living bacteria and enzymes that will liquefy and digest organic wastes. The organisms in N-Zyme continually reproduce to create additional enzymatic actions to greatly accelerate the biological functions necessary for proper sludge treatment in digestors or Imhoff tanks. If your sewage treatment plant has problems in attaining proper sludge digestion it will pay you to investigate the features of new O-Cedar N-Zyme.



INDUSTRIAL PRODUCTS

O-CEDAR

2246 W. 49TH ST., CHICAGO, ILLINOIS
DIVISION OF AMERICAN — MARIETTA CO.



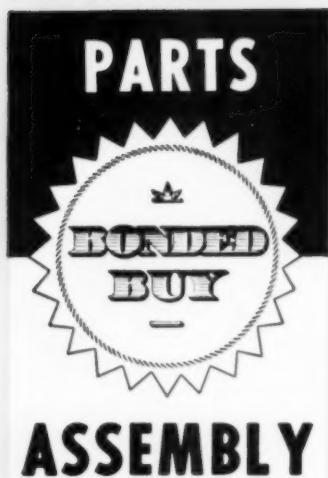
SPECIAL REPORT TO CATERPILLAR OWNERS:



Parts you can trust
... cost less per hour

announcing...

BONDED BUY PARTS ASSEMBLIES



PARTS ASSEMBLY

Guarantee Bond

Know All Men by these Presents,

that _____
of _____ (hereinafter called Seller),
is held and firmly bound unto _____
of _____ (hereinafter called Buyer)

in the sum of not exceeding the lesser of FIVE THOUSAND DOLLARS (\$5,000.00) or Seller's price,
with respect to each parts assembly described below, for the payment of which Seller hereby binds
himself, its successors and assigns by these presents.

The Condition of this Obligation is such that Whereas Seller has sold to Buyer the below-described
parts assembly or assemblies originally manufactured by Caterpillar Tractor Co. and reconditioned
in accordance with practices recommended by Caterpillar Tractor Co.

DESCRIPTION	PART NUMBER	SERIAL NUMBER	SALE PRICE

And Whereas Seller guarantees each said parts assembly against unsatisfactory performance due to
defective material or workmanship for _____ days after the date of sale shown
below (herein referred to as the guarantee period), the obligation under this guarantee being only to
repair or replace, as Seller may elect; any said assembly which proves defective in material or work-
manship under conditions of normal use during the guarantee period at Seller's expense (including
cost of all necessary materials and labor) up to a maximum of the lesser of Five Thousand Dollars
(\$5,000.00) or Seller's price, with respect to each said assembly, except that the cost, if any, of trans-
porting each said assembly from and to Seller's place of business shall be paid by the Buyer.

Now, Therefore, if Seller, its successors and assigns shall in all respects well and truly perform the obli-
gation under the guarantee recited above, then this obligation shall be void, otherwise to remain in
full force and effect.

THE ABOVE GUARANTEE IS VOID, AND SELLER SHALL BE UNDER NO OBLIGATION
THEREUNDER, IF CLAIM IS NOT MADE TO THE SELLER WITHIN THREE (3) DAYS
AFTER DISCOVERY OF THE DEFECT UPON WHICH THE CLAIM IS BASED.

You can have complete confidence in any Parts Assembly Exchange or Rebuilt Unit carrying the dealer's new Bonded Buy label. You'll receive a Guarantee Bond, backed by the Lumbermens Mutual Casualty Company of Chicago, Illinois, giving the guarantee conditions agreed upon at time of sale. This is further evidence that a Caterpillar Parts Exchange or Rebuilt Assembly is in first-class condition—another way of expressing the careful and thorough workmanship that goes into each of these reconditioned assemblies.

The cost? It compares favorably with the cost of doing the reconditioning work yourself. Often less... because of the availability of special equipment and servicemen's skills in the dealer's shop. Your final net cost is based on parts and labor necessary to put your worn assembly in A-1 condition—same as the exchange unit you receive.

Here's why Cat Reconditioned Assemblies save you money. You trade down time for more go time. Simply:

1. Call your Caterpillar Dealer and arrange for the Parts Assembly you need.
2. Remove your worn assembly and install the reconditioned unit.
3. Put your machine back to work immediately and return the worn unit to your dealer.

Any way you look at it, a Bonded Buy Parts Assembly is a good deal. You get a dependable unit... guaranteed in writing. The cost is approximately the same had you done the work yourself. Time saved can be converted to cash because your machine's working and earning. Contact your Caterpillar Dealer today. Find out what assemblies he stocks (new items are being added daily).

SERVICE TIP:

Never allow your present machine components to become worn to the point where reconditioning is impossible.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

COUNTY PREPARES A MASTER PLAN FOR Refuse Disposal

This article is based on a "Master Plan for Refuse Disposal" which was prepared for Orange County, Calif., and which was forwarded to us by A. S. Koch, County Surveyor and Road Commissioner.

WITH the continuing growth of Orange County, there will be an increasing demand for refuse disposal facilities. The task of finding new sites to replace the rapidly exhausting old ones has confronted the County since 1953 when land-fill disposal began. The practice of acquiring sites on a buy-as-you-need basis has provided only temporary solutions to the refuse disposal problem. Furthermore, the type of facility which provided a

short term solution has now grown scarce. The abandoned sand or gravel pit required 20 years to excavate but is filled with refuse in less than three years. It is therefore obvious that the County must make long-range plans.

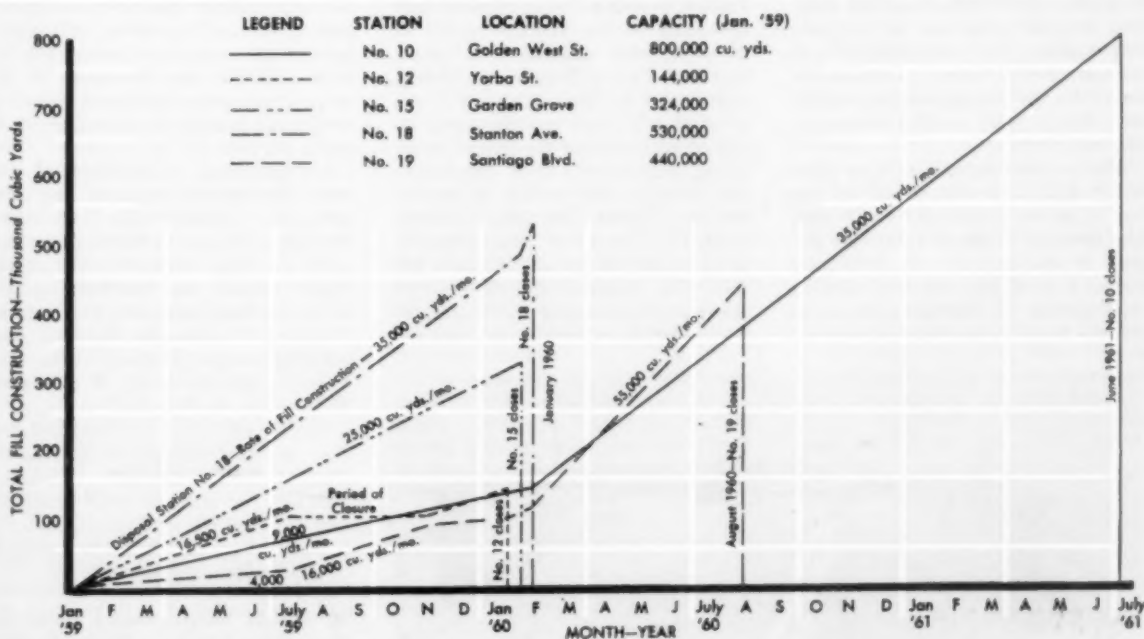
The County entered the disposal picture in 1946 in an effort to prevent dumping of refuse along roadsides. General policy now prevailing is as follows: 1) Facilities will serve the cities and unincorporated area with no charge for disposal. 2) Material is limited to household and commercial trash, garbage and liquid and industrial wastes not being acceptable. 3) Trash originating outside the County is not accepted. 4) Salvage

operations at disposal sites are prohibited.

The County is not concerned with collection. The residents of the County are provided with collection service: 1) As a municipal function paid for from tax funds or performed by city forces or by contract under city control, 2) through sanitary districts, and 3) by private arrangement with collectors operating in franchised areas. An average price for once a week service is \$1.25 per month. Thus, the fundamental concepts are local collection with disposal beyond the local haul by the County.

There are now eight disposal sites, but only three of these can be considered long lived; the other

● ESTIMATED life expectancy of five critical refuse disposal sites used by Orange County, California.



five have life expectancies of 3 months to 2 years. Experience has shown that in dealings with even friendly property owners for acquiring sites, two years or more elapse between the initial contact and the opening of the disposal site.

Various estimates for the future population of Orange County are available. These seem to indicate a total of 2 to 2.5 million by 1980, and an ultimate population of 3 million. Based on these estimates and a refuse production of 3 pounds per capita daily in the near future (2 lbs. per capita domestic and an equivalent of 1 lb. per capita from commercial and industrial establishments), provision for disposal eventually of 4,500 tons per day must be made.

(The report discusses in considerable detail disposal by incineration, composting, ocean dumping, grinding and discharge to sewers, feeding to swine and operation of sanitary landfills. Advantages and disadvantages are presented and estimated initial and operating costs are worked out in a sound manner. Since the considerations that exist appear to favor disposal by landfill, only that portion of the report will be considered here.)

The foothill areas bordering the north, east and south portions of the County represent favorable potential locations for landfill sites. These locations, however, are enough distant from the more heavily populated areas to constitute a hauling problem if present methods are used. The disposal sites now in use permit hauling by collection truck, though this is costly, being estimated for the average truck at about 40 cents a mile, or 11.4 cents per ton-mile.

The present landfill system costs about \$1.25 per ton based on the use of seven scattered landfill sites and disposal of about 1,000 tons per day. If the number of sites were reduced to 5 and transfer stations with special hauling units employed for the areas more distant from the

disposal sites, it is estimated that the unit disposal cost can be reduced materially.

The unit disposal cost, it is estimated, can be reduced to about 47 cents per ton, including equipment and amortization, on the basis of 4,500 tons per day. To this must be added the cost of the land and its improvement and maintenance. This is estimated at 8 cents per ton. However, with the five landfill sites in operation, a sizable portion of the County's population will be faced with an excessive haul; and it is felt that the cost of this haul over that which might normally be expected in the case of other methods of disposal (as an incinerator, which could be built near the centers of refuse production) should properly be charged to landfill costs. With an average round trip overhaul of 15 miles, the cost of hauling by collection vehicles would be \$1.71 per ton based on 15 miles at 11.4 cents per ton-mile. Since the overhaul would apply to about one-third of the future estimated population, the average cost including disposal cost for the County as a whole would be \$1.12 per ton.

Since the sectional density of the population throughout the county will change, these figures will not remain fixed; however, they appear to represent a fair picture of conditions. Adoption of a transfer plan, whereby a station located centrally in the area would be the actual point of disposal for the collection vehicle would save money. Using a vehicle having a 22-ton capacity and operating at an average speed of 20 mph, the estimated operating cost based on a 25-mile round trip, was found to be 74 cents per ton or almost 3 cents per ton-mile. To this must be added the cost of operating, maintaining and amortizing the transfer station and its appurtenant facilities. This cost, when the station is operating near capacity, is estimated at about 26 cents per ton. The probable annual cost of operating, amortizing and maintaining a station to handle 840 tons per

day 6 days a week is \$66,000; but if delivery falls much below this volume, unit costs rise.

The cost of the transfer station operation must also be considered in the light of the reductions of haul costs within the collection zone. These haul costs approximate 11.4 cents per ton-mile. The most economical overall design, therefore, will be that which produces a minimum total station cost plus local hauling cost. These costs were determined for various conditions and for the ultimate population it appears that four transfer stations would provide the most economical overall condition.

The probable cost of operating the landfill sites are illustrated by an example. Site A, to serve a population of 875,000, would receive 1,500 tons of refuse per day on a 6-day week basis. The combined cost of operating Site A and the four other proposed Sites, B, C, D, and E, would be as follows: The 14 custodians and 24 equipment operators would be paid \$268,000 per year, to which must be added 16 percent overhead, making a total of \$311,000 per year. Equipment, consisting of 24 tractors at \$5 per hour and 7 carryalls at \$3.80 per hour (these figures including amortization and maintenance) would cost \$428,000 per year. Other costs are estimated at \$25,000 per year. The total cost of \$764,000 per year represents a cost of 47 cents per ton disposed of.

Costs for land at \$2,500 per acre; roads, 1½ miles per site; buildings; fencing at \$3,000 per site; utility installations and services; and miscellaneous costs are estimated to total \$129,320 on the basis of 30 years of operation, with maintenance and amortization, amounting to 8 cents per ton.

Computations on the basis of the total investment required by the program indicates the following: 750 acres of land at \$2,500 per acre; improvements, \$380,000, of which roads account for \$350,000; equipment, \$888,000, including 24 tractors, 7 carryalls, 2 standby tractors, one standby carryall, rosters, trucks, etc. Total investment necessary would be \$3,143,000.

Estimated cost for establishing four transfer stations is \$1,343,000. This includes \$300,000 for land; \$424,000 for stations and facilities; and \$619,000 for equipment, including 31 trailers and 22 truck-tractors, plus standby equipment.

● REFUSE transfer station typical of those planned for use in Orange County.



DESIGN OF SEWAGE PUMPING STATIONS



● THIS SEWAGE PUMPING station is in a residential area where neighboring homes are in the \$30,000 to \$40,000 bracket. Attractive appearance overcomes objections.

H. H. BENJES

**Black & Veatch, Consulting Engineers,
Kansas City, Missouri**

SEVERAL basic considerations must be kept in mind in arriving at and proceeding with the design of a sewage pumping station. First, a detailed study of the topography of the drainage area to be served must be made with consideration given to both present and future developments to assure the best location for the pumping station. After selection of the location, an economic analysis is required to determine whether a pumping station is more economical than providing gravity service through or around the high-ground downstream; the capitalized cost of a pumping station including its operation and maintenance cost will usually justify a considerable first cost to obtain gravity service, and the best course to follow can usually be determined only by making an economic comparison.

Special consideration should be given to the type of equipment and to the structure housing the equipment. The location of the station will largely govern the type of superstructure and its exterior finish. If located in a built-up area, the superstructure should be similar to,

or blend with neighboring structures. If in an isolated area, the type of structure can be left to the discretion of the owner and engineer. It has been said that people smell with their eyes and their ideas as well as with their noses; therefore, in any case, the structure should be attractive and the grounds landscaped to overcome, as much as possible, this popular prejudice against sewage works. In this respect, odors must be prevented, especially when the station is or will be in a developed area. Proper design of the wet well to prevent deposition of solids and adequate ventilation will usually control objectionable odors; special treatment of the ventilating air may be required if the station receives stale or septic sewage.

The capacities of all downstream conduits which will receive the discharge from the pumping station should be checked as they may limit the station capacity. Likewise, flood levels should be checked and the operating floor placed to preclude the possibility of flooding equipment and motors.

The protection of life, health, and property requires the greatest reliability in the design, selection,

operation and maintenance of the pumping equipment. Usually pumping equipment is driven by electric motors; but, where electric motors are used, reliable power must be supplied. Two incoming power lines with automatic switching equipment to transfer the load from the preferred source to the standby source in case of a power failure is considered minimum service for complete reliability. Where such reliability cannot be obtained, standby engine-driven generators, standby engine-driven pumping units, or all engine-driven pumping units may be required where sewage cannot be by-passed.

If possible, an emergency overflow or by-pass should be provided to protect the pumping station in case of equipment or power failure, or in the case where the incoming sewage flow may exceed the station capacity; however, these overflows must be limited to locations where they will not be injurious to health or property.

Station Capacity

Population, commercial and industrial development, geology, topography, local building construction customs, and the economic level of

the people served, all influence the quantity of flow from the tributary area served by a sewage pumping station. A study of all of these is required for both present and future conditions in determining the capacity for which the station should be designed. Not only the maximum flows reaching the station are of interest, but also the average and minimum flows, since these will influence the design of the wet well and the selection of the pumping equipment. It is axiomatic that the station must have firm capacity to handle the maximum flows if the station is to serve its functional purpose. Conversely, the station must be capable of handling the minimum flows without creating a nuisance by retaining sewage too long and of operating with maximum efficiency under normal or average conditions.

Usually stations are designed with capacity sufficient to handle the flow requirements for a period of at least 10 years in the future with provisions being made in the original design for increase in capacity by the addition of more pumping units, or by replacing the original pumping units with one of larger capacity. The latter is sometimes accomplished by selecting initial units which can be increased in capacity by installing larger impellers.

Pumping Equipment

Pumping equipment used in sewage stations may be classified into two general types: centrifugal pumps and pneumatic ejectors. Pneumatic ejectors are ordinarily used only in the smaller installations where a 4-inch sewage pump is too large to provide satisfactory operation. Pumping equipment should be selected which is rugged in construction and which will operate without vibration or cavitation within the extreme range of headcapacity conditions for the station. Most pump designers will agree that horizontal units are inherently more stable than vertical units and especially where vertical units are used, careful attention should be paid to assure that equipment will be obtained which does not have excessive vibration. There is no general agreement among pump designers as to the maximum tolerances for vibration; however, the author believes that if long-life maintenance-free equipment is desired, then the amplitude of vibration as measured at any point in or on the machine depends upon the rotative speed of the equipment and should not exceed the following:

Nominal Rotative Speed, rpm	Maximum Amplitude Peak to Peak, mils
1800	1.5
1200	2.0
900	2.6
720	3.2
600	4.0

Furthermore, it is believed that the ratio of pump rotative speed to critical speed should always be less than 0.4 or more than 1.4 and that the vibration amplitude of the pump shaft measured at the face of the stuffing box should be limited to 2.0 mils. The user of modern pumping equipment has a right to expect units which operate without excessive vibration and to accomplish this, specifications should require that the manufacturer furnish equipment with rotating parts accurately machined and in as near perfect rotational balance as is practical to obtain; also, the mass of each unit and its distribution should be such that resonance at normal operating speeds is avoided.

Pump seals should be designed to prevent excessive leakage and maintenance; glands and bolts for stuffing boxes should be of corrosion resistant material. Shaft sleeves through stuffing boxes should be of corrosion and abrasion resistant material with a Brinell hardness of not less than 450.

Bearings must be adequate for the service and in the author's opinion, should be designed on the basis of not less than a minimum life of 5 years in accordance with the Anti-Friction Manufacturers Association life and thrust values.

The pumping equipment is the heart of a sewage pumping station and, therefore, the station will fail in its functional purpose if the equipment does not perform in a satisfactory manner. For this reason, the engineer should never try to economize in purchasing pumps, but should try to obtain the best equipment available although it may be necessary to pay a premium to obtain such equipment.

Pump Selection

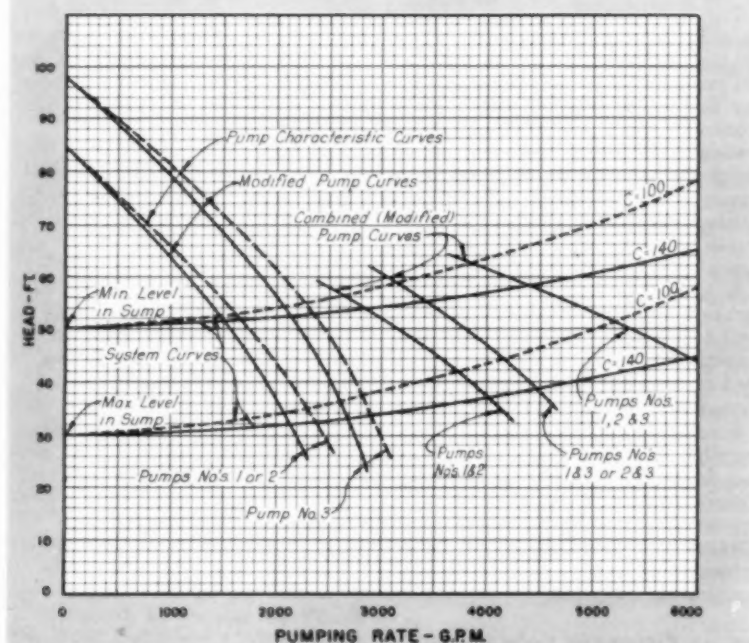
The number of pumps to be installed in a station will be dependent largely on the station capacity and range of flow. In considering station capacity it is customary to provide a total pumping capacity equal to the maximum expected inflow with at least one of the largest pumping units out of service; in large stations, two units are sometimes considered out of service in determining firm capacity. A minimum of two pumps should be installed in any station

except where a pneumatic ejector is provided to serve less than 50 houses.

In small stations with maximum inflows of less than 1.0 mgd, two pumps only are customarily installed with each unit having capacity sufficient to meet the maximum inflow rate. For larger stations, the size and number of units should be selected so that the range of inflow can be met without starting and stopping pumps too frequently, and without requiring excessive wet well storage capacity. In many cases, variable speed drives are provided to match the pumping rate with the inflow rate.

Sometimes the capacity and depth of the wet well can be coordinated with the pumping units so that the rise and fall of the water level in the wet well will result in a variable pumping capacity which will nearly match the inflow rates. This is possible since all centrifugal pumps have the inherent characteristic that as the head increases, the capacity decreases. In stations where the pumping head is low, the normal range of levels in the wet well will vary the pumping head to the extent that a wide range of capacities may be obtained with each individual unit.

Pumps should be selected having head-capacity characteristics which correspond, as nearly as possible, to the overall station requirements. This can best be accomplished by the preparation of system head-capacity curves showing all conditions of head and capacity under which the pumps will be required to operate. The head-capacity curve is developed using standard hydraulic methods for determining friction losses. It is impossible, however, to predict accurately the total friction loss to be realized over an extended period of time for a long pipeline; when a line is new, friction losses will be at a minimum and will increase with use. These friction losses will materially affect the capacity of the pumping units and also their successful operation. For this reason, system curves should be developed to show the expected maximum and minimum friction losses in the pipeline during the lifetime of the pumping units. Where two or more pumps are being considered, discharging into a common header and pipeline, it is advantageous to omit the head losses in the individual pump suction and discharge lines from the system head-capacity curves because the head-capacity of each unit will vary depending upon which units are operating in parallel.



● FIGURE 1. Typical set of system curves together with individual pump characteristic curves, modified pump curves and combined curves for multiple operation.

To obtain a true picture of the output capacity of multiple pump operations, the head losses in the suction and discharge piping for each individual pump can be deducted from the individual pump characteristic curve (1). This provides a modified curve which shows the pumping performance at the station header. By adding the capacities for points of equal head, performance of multiple pump operation at the station discharge header is obtained. Figure 1 shows a typical set of system curves, together with representative individual pump characteristic curves, modified pump curves, and combined modified pump curves showing multiple pump operation. The intersection of the modified pump curves and the combined modified pump curves with the system head-capacity curves shows the station pumping capacity for the several conditions of operation. Figure 1 shows four system curves, two curves with a Williams-Hazen coefficient (C) of 140 for maximum and minimum water levels and two curves with a Williams-Hazen coefficient (C) of 100 for maximum and minimum water levels. These coefficients usually can be considered as the maximum and minimum coefficients which will be obtained in sewage force mains. The pumps selected should deliver the station capacity at the maximum head. How-

ever, this capacity and head will not necessarily be at the point of maximum pump efficiency as pumps should be selected having their maximum efficiency at the average operating conditions. In the case of Figure 1, assuming that the total station capacity is to be obtained by operating pumps numbers 1, 2 and 3 in parallel, the total head required at the station discharge header would be approximately 51 feet, with maximum sump level and assuming $C = 100$ in the discharge line. Projecting this point horizontally to the individual modified pump curves and thence vertically to the pump characteristic curves, the required head for pumps numbers 1 and 2 would be 54 feet and for pump number 3 approximately 57 feet. The difference in head between the head required at the station header and the head required for each pump is the head loss in the suction and discharge piping for each individual pump.

Figure 1 also indicates the minimum head at which each individual pump may operate. In the case of pumps numbers 1 and 2, this minimum head is approximately 39 feet; for pump number 3 it is approximately 42 feet. These minimum heads are important and should be furnished to the pump manufacturers since they may determine the maximum brake horsepower required to

drive the pump and the maximum speed at which the pump can operate without cavitation.

It must be remembered that the capacity of a centrifugal pump is a variable and will depend upon the total head at which the unit operates. Capacities for multiple pump operation can be obtained only by a study of the individual pump curves and system curves. When a pump is referred to as having a certain capacity, this capacity applies only to one point on the characteristic curve and will vary depending upon the actual pumping head conditions.

The maximum speed at which a pump should operate is determined by the net positive suction head available at the pump, the quantity of liquid being pumped, and the total head. When specifying pumps, especially those which are to operate with a suction lift, the speed at which the pumps will operate should be checked against the Hydraulic Institute (2) limiting suction requirements. Sewage pumps should not be operated ordinarily at speeds in excess of 1800 rpm.

Wet Well Design

Wet wells are required for all sewage pumping stations. The capacity needed for the wet well will be dependent upon many factors and, for this reason, it is impossible to establish any definite rules as to the capacity required for any given amount of pumping capacity. However, there are several principles which should be followed if satisfactory operation is to be expected. Frequent on-off cycling of the pumps should be avoided to prevent excessive wear of switching or starting equipment; the cycle of operation for each pump should not be less than 5 minutes. On the other hand, the wet well should not be so large that the sewage is retained too long with consequent creation of septicity and nuisances; probably under no condition should the sewage be retained in the wet well longer than 30 minutes and a shorter retention time than this is desirable. With variable speed controls now available, many stations can be designed so that the pumping rate matches the inflow rate and the inherent difficulties of frequent pump cycling or long retention times in wet wells can be avoided.

To prevent the build-up of sludge banks in the bottom of the wet well, fill concrete should be provided with slopes not greater than one horizontal to 1.75 vertical in those areas where deposition is likely to occur.

Wet wells must be adequately

ventilated with venting capacity sufficient to allow the entrance or exit of air equal to the maximum rise or fall rate of the liquid in the wet well, and also to preclude the build-up of any noxious or inflammable gases in the wet well space.

Rooms located directly over wet wells should be sealed from the rest of the station if there are any openings leading from the room to the well, and, in addition, should be provided with positive ventilation such that the room air pressure is slightly above atmospheric.

The pump suction inlets should be arranged in the wet well to assure adequate submergence and to preclude the formation of vortices or the entrance of air into the pump, either of which may cause pump damage or a decrease in pumping capacity. For most stations, bell-mouth inlets are desirable with the bell-mouth in a horizontal plane at a distance of approximately one-half the bell-mouth diameter above the wet well floor. The flow of water into the wet well should prevent currents or splashing from occurring with vortices being formed or air entrained in the sewage as it is picked up by the pumps. The operating levels in the wet well should provide static submergence of the pumps at all times as it is usually not feasible to provide priming equipment which will operate satisfactorily for sewage service, except in the very large installations.

Screening

It is usually prudent to provide screens ahead of sewage pumping equipment except in the relatively small installations serving only residential areas. Small installations are sometimes provided with manually-cleaned screens of the basket or bar rack type. The larger stations should be provided with mechanically cleaned screens which may be of either the front cleaned or rear cleaned type. Except for cable type screens which seem to perform satisfactorily when raking the front of a screen, the trend has been to the rear-cleaned type where the raking equipment is operated on an endless chain with the operating mechanism entirely behind the bar rack.

Bar screens are fabricated of wrought-iron or steel bars placed in a vertical or sloping vertical direction. The space between the individual bars will vary depending on the size of the pumping equipment, but for most installations a clear spacing of $1\frac{1}{2}$ to $2\frac{1}{2}$ inches is provided for manually cleaned screens and a clear spacing of 1 inch is pro-

vided for mechanically cleaned screens.

The area of the bar screen should be such that the velocity through the clear openings in the screen does not exceed $2\frac{1}{2}$ feet per second under any flow condition, and where mechanical screens are used, the operating levels in the wet well or a restriction down stream from the screen should maintain a depth of not less than one foot ahead of the screen to assure satisfactory operation of the cleaning mechanism.

A head loss of approximately 6 inches across the screen should be included in the hydraulics of the station, and where manually operated screens are used, a higher loss should be allowed.

Screenings may be disposed of by burying, incineration, or by grinding. In the latter case, the ground screenings can be returned to the sewage flow. A water supply should always be provided at some convenient location near the screens for washing-up purposes.

Piping and Valves

The piping and valves in a sewage pumping station should be designed to convey the sewage without excessive head losses or deposition in the lines. With the exception of suction piping where head losses may be limited by pump characteristics, the sizing of piping and valves is basically one of economics; that is, the optimum size for the piping and valves is that which will result in the minimum annual cost considering both the initial investment and the cost of power for operation. For most stations the maximum velocities in the suction piping and the discharge piping will be 5 fps and 8 fps respectively; however, these are by no means limiting velocities because it may be found in the economic analysis, especially for large stations, that higher velocities can be justified. Lines less than 4-in. should not be used to convey raw sewage.

Valves should be provided on the suction and discharge side of each pump, except where the individual pump discharge lines discharge above the hydraulic gradient, to allow for removal and maintenance of individual pumping units without disturbing the functioning of the remainder of the station. All piping should be designed with inherent flexibility to allow for strains from expansion and contraction and, also, should be provided with sufficient hub-end or mechanical joints to allow for making up piping tolerances in the initial installation. Hangers,

supports, and anchors for piping should be designed for both dead and dynamic loads keeping in mind that the piping must be adequate for not only the working pressure, but also surge pressures and test pressures which may be imposed upon the piping.

The vertical discharge risers from individual pumping units should enter the side of the discharge header, rather than the bottom, so that solids in the sewage will not drop into risers from idle units. Separate suction lines should be provided for each pump with the piping arranged so that it can be readily entered for cleaning, and for the dismantling or removal of equipment.

Various kinds of valves are used in sewage pumping stations depending upon the function to be performed; however, in any case, valves should provide clear openings without internal projections which will catch rags or other stringy material. The installation of gate valves in horizontal piping conveying sewage should be avoided as deposition of solids in the bonnets and seats will probably cause difficulty in operation and maintenance.

Drain and vent valves are required at low and high points in the piping to facilitate draining and venting of lines.

The general arrangement of the piping should present a neat and orderly appearance which can ordinarily be obtained by making all piping runs either parallel or perpendicular to the walls, floors and ceilings of the rooms in which it is installed. Piping should be located so that it does not block access to major items of equipment and valves, and should be installed with clearances of at least 7 feet where above aisles or walkways.

Surge Controls

Where the pumping station discharges into a force main of any appreciable length, careful attention should be given to the surges which may occur with changes in fluid motion when pumping units are placed in or taken out of operation, or in the event that the station drops off the line due to a major power failure. Because any change of fluid motion in a conduit involves a change in kinetic energy and in pressure energy, a change of fluid motion is theoretically always accompanied by surge, the magnitude of which will be dependent upon the amount of the change in motion and the rate of acceleration or deceleration. The intensity of surge pressures likely to occur in station operation

can be estimated by methods outlined in a number of standard texts (3) (4).

The control of surges due to normal starting and stopping electric motor driven pumps may be controlled by 1) selecting individual pump capacities such that the change in velocity in the system due to starting or stopping a single pump will not result in excessive surges, 2) by the use of variable speed drives gradually to bring pumps on or off the line or 3) by the use of motor or hydraulic-operated valves installed in each pump discharge line. The valves should be so interlocked with each pump motor that when starting, a unit is brought up to speed and its discharge valve then gradually opened, and when stopping, the discharge valve is first gradually closed before tripping the breaker serving the unit.

Surge control in the event of a power failure can be accomplished by devices which will open on an increase in pressure and thus relieve the excessive surge pressure by exhausting sewage from the system, or by devices which will exhaust sewage from the system upon a sudden drop in system pressure anticipating a surge. The application of proper

surge control can in some cases be rather complex, and requires familiarity with control devices and a thorough knowledge of how pressure waves are propagated when a change in velocity occurs in a conduit.

Pump Drives

Pump drives are generally electric motors; they may be, however, gasoline or diesel units where firm power is not available or where the duty of pumping occurs at very infrequent intervals. Variable-speed drives are used quite extensively in sewage pumping. These drives generally consist of variable speed motors, or constant speed motors with adjustable slip-couplings of either the magnetic or hydraulic type. The selection of the type of variable speed drive is usually based upon initial cost and space requirements, since there is little difference in efficiency of operation. The choice between horizontal and vertical motors depends considerably upon the station arrangement. The horizontal motors are more generally available and less expensive.

The type of motor enclosure depends upon the surrounding atmosphere. Motors located in atmospheres with excessive moisture or corrosive gases require special insulations and enclosures. Open motors in well ventilated stations are less expensive and more easily maintained. Constant speed motors below 200 hp. are generally squirrel cage induction. The choice, on larger motors, between the induction and synchronous types depends largely upon the power factor considerations. Space requirements are greater for synchronous units. Variable speed units are always more expensive than constant speed units and require more space for control equipment. The many types of motors with their various constructions, insulations, enclosures, and operat-

ing characteristics, permit the selection of the drive most suitable for each particular station.

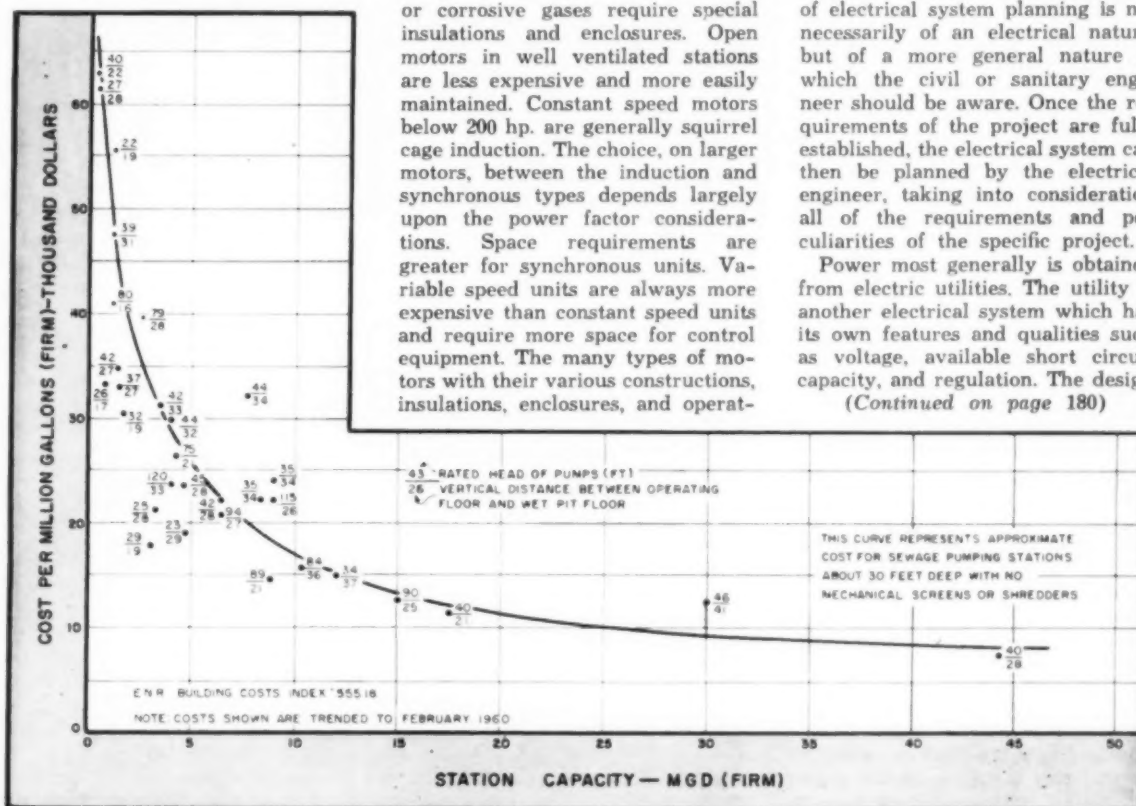
Electrical Systems

For each particular pumping station, electrical system planning must incorporate all of the required uses of electricity for power, lighting, control, and communications into one well coordinated system. The relative importance of certain qualities and features such as adequacy, reliability, expandability, serviceability, initial cost, and operating expense, are only some of the considerations that must precede any detailed planning. Not all of these can be given equal proportions; the greater the reliability, generally, the more costly; the greater the expandability and flexibility, usually the more space that is required; the lower the operating expense, often the higher initial cost; the lower the initial cost, the more maintenance required.

It is well to recognize that nearly identical stations may have a wide variety of electrical facilities, depending much more upon requirements placed upon that station, than the specific apparatus within the station. Thus, the very initial phase of electrical system planning is not necessarily of an electrical nature, but of a more general nature of which the civil or sanitary engineer should be aware. Once the requirements of the project are fully established, the electrical system can then be planned by the electrical engineer, taking into consideration all of the requirements and peculiarities of the specific project.

Power most generally is obtained from electric utilities. The utility is another electrical system which has its own features and qualities such as voltage, available short circuit capacity, and regulation. The design

(Continued on page 180)



● COSTS of sewage pumping stations. Curve was developed by Black & Veatch and covers locations throughout the middle west.

PEDESTRIAN TUNNEL

Overcomes TRAFFIC BOTTLENECK

JOSH HALBERT
Director of Public Works,
Jackson, Mississippi

JACKSON, Mississippi, is currently enjoying a tremendous economic boom with business at an all-time high. As a result, the city is growing in every direction. Accompanying this economic surge is an unprecedented demand for new and larger streets. The city commission, headed by Mayor Allen Thompson, is moving with speed to approve construction of new facilities and to modify existing facilities to handle the increased traffic. One specific problem involved a traffic bottleneck in the form of a railroad overpass at Monument Street.

The overpass structure was wide enough to carry safely only one lane of traffic in each direction because a sidewalk on each side used up the greater portion of a second lane. The Public Works Department devised the plan of ripping up the two existing sidewalks in the underpass to add an extra lane in each direction. A pedestrian underpass to be installed behind the south abutment would take care of pedestrian traffic.

After careful cost analysis, a No. 7 Armco underpass installed by the tunneling method was chosen as the most economical solution. The construction contract was awarded to the Armco Construction Service. The tunneling job was not an easy one because old piling, sewer pipe, and broken concrete were encountered during construction. Even so, the five-man construction crew installed the structure in three weeks.

The 106-ft. long underpass structure itself is elliptically shaped with an inside height of 111 in. and an inside width of 89 in. It was made of 7-gage, galvanized Armco liner plates, 10 percent ellipsed and coated on the outside with a bitumastic-type paint before installation. After the structure was erected it was pressure grouted through grout holes in the liner plate. Interior lighting was provided by incandescent bulbs mounted on the ceiling at 15-ft. intervals with conduit attached directly to the metal liner.

The final in-place cost of \$15,949 for the pedestrian underpass, installed by the tunneling method, was approximately \$10,000 less than estimates for a similar underpass installed by the open-cut method.

Following the completion of the pedestrian underpass, the sidewalks under the railroad overpass were removed, and now four lanes of traffic are available to motorists on Monument Street.



● UNDERPASS to permit widening the bottleneck shown below was constructed of 7-gage liner plates. It is 106 ft. long, elliptical in shape, 89 by 111 ins. in size.



● TUNNELING for pedestrian underpass is under way in circle at left. Removal of sidewalks from old underpass at right permitted two lanes of traffic each way.

● AIR HAMMER is used to clean out hole before shifting the Kochring No. 10 Mudjack into position for lifting.

A SMALL pavement imperfection can mean a big bump and an even bigger complaint if the driver is paying a toll for the privilege. To smooth out the bumps and to protect its investment, the Ohio Turnpike has concentrated on a preventive pavement maintenance program. Joint and crack sealing, edge sealing, mudjacking and early repair of surface failures have been given prime consideration in program scheduling. Where patching or



PAVEMENT MAINTENANCE ON THE OHIO TURNPIKE

slab replacement has been required, the pavement has generally been restored to original condition using like materials.

Pavement design on the Ohio Turnpike provided for two 24-ft. wide directional roadways, each constructed of 10-in. reinforced concrete laid on a full-width blanket of 6-in. of selected subbase material. The pavements are each flanked by 8-ft. inside and 10-ft. outside shoulders of 3-in. penetration macadam. The maintenance program is roughly divided into three categories: 1) Protection or restoration of slab support; 2) joint, crack and edge maintenance; and 3) slab and surface repairs and protection.

The most common location requiring restoration of slab support or leveling of the pavement surface has been at structure approaches. All structures carrying the Turnpike roadways are constructed on spill-through abutments with heavily reinforced approach slabs. Additional consolidation, however, of the hard-to-compact fill adjacent to the abutments has been encountered frequently. Pipe and culvert trench backfills are another likely source of trouble. Occasionally, heavy fill sections will develop differential settlements requiring some pavement leveling but this is not a frequent occurrence.

Mudjacking, the process of pumping a cement slurry under a pavement slab, has developed into a significant program in attempts to provide base restoration and/or sur-

face leveling. This procedure is used to correct three distinct and separate types of rigid pavement problems: 1) Surface irregularities caused by settlement; 2) voids under slabs without resultant settlement—usually adjacent to structure abutments or over narrow pipe trenches; and 3) pumping or flexing at joints—usually resulting from voids and excessive free water in subbase.

The operation starts with the layout of the 2½-in. diameter holes through which the slurry will be pumped. The positioning of the holes is dictated in part by the extent and configuration of the area to be jacked and in part by spacing limitations requiring: 12-in. minimum clearance from joints and 18-inches from pavement edges; 6 feet longitudinal and 4 feet transverse spacing between holes. Hole drilling has been carried out with pneumatically operated jack hammers and is usually scheduled to precede the mudjacking crew's arrival by a day or two.

Upon inspection of the subbase condition, viewed through the drilled holes, the mudjacking crew can determine the required viscosity of the slurry mixture. Where large voids are found under the slab or faults in the embankment are evident, the water content in the slurry is reduced to create a stiffer mix. Where little or no clearance is noted between the slab and subbase, the initial slurry must be of a thin consistency to penetrate the area of the slab underface where lifting

action can be started. In instances in which no apparent void exists between the subbase and slab, an air hose is often used to blow out sufficient of the subbase material to create an opening into which the slurry can start flowing.

After some period of experimentation with various slurry mixtures of Portland cement and sand, clay or limestone dust, the Turnpike developed its own "home brew" which seems to give very satisfactory results. For standard jacking operations the slurry contains: 2 parts Portland cement; 4 parts fine limestone dust; and 6 parts coarse limestone dust. The fine (80 percent passing the 200 mesh) and coarse (75 percent passing the 100 mesh) ground limestone assures a controlled quality of material and provides a rich creamy slurry which flows readily, is non-abrasive to pumps and hoses, and cures to form a very stable slab support.

The consistency of the mixture is varied by the crew with a formula that is largely experience. The thinner the mixture, the wider the area affected. Stiff mixtures concentrate lifting action on a more confined area around the hole into which the material is pumped. Thus some control can be exercised over jacking action in critical areas such as adjacent to structure abutments or on uneven settlements. A good measure of an effective mixture is available by watching holes adjacent to the one being worked. The slurry should show in the surrounding hole pattern and should visibly pul-

sate with the action of the pump.

Equipment for this operation includes an 11 cu. ft. power-driven concrete mixer with skip and one or two small tub-style displacement pump mudjacks. These pumps develop approximately 100 psi pressure in the slurry. General practice has been to carry-on mudjacking "under traffic." In effect, this means that traffic is alternately diverted from one lane and then the other as a 24-ft. wide slab section is being raised. The action of traffic was found to be beneficial in leveling a slab and implementing distribution of the slurry in a uniform lens on the underface. No traffic restriction is made during the curing period.

Several rules of thumb were developed for guiding the mudjacking operations. The lowest point on the slab is generally the best starting point. Care is taken not to attempt to lift too much from one hole—generally no more than $\frac{1}{4}$ inch. When removing a full-width depression in the pavement, one side is lifted no more than one-half the total distance without alternating to the other side. If two jacks are being used concurrently, care is taken that they are not working in adjacent holes. This might create a line of stress that could crack the slab very easily. Particular caution has to be taken to avoid lifting an approach slab from its abutment seat and forming a shelf of slurry that will perpetuate a bump. When the jacking operation has been completed each drill hole is carefully cleaned and a dry mixture of 1 part Portland cement and 3 parts sand is thoroughly rodded into place to cure and plug the hole.

In some areas of high ground-water table and in the down-hill stretches of some long tangent grades, edge-blowing has developed between the concrete slab and penetration-macadam shoulder. These areas also often develop bleeding of water up through the contraction joints. For these conditions, the problem has been attacked in two ways. First, minimize the surface infiltration of moisture by careful sealing of all pavement cracks and joints and by the restoration of the bond between the concrete pavement and the penetration macadam shoulder. Second, reduce the moisture content in the subbase material by the installation of french drains and/or perforated pipe from the pavement edge to the slope face.

As was mentioned earlier, considerable emphasis is given to the maintenance of pavement joints and cracks and to the edge joint between



● WORKMEN fill cleaned joint with rubberized asphaltic material pumped through hose and extrusion nozzle. Trailer-mounted 125 cfm air compressor operates pump.

pavement and shoulder surface. Primarily because the equipment is geared to that type of material, the Turnpike has been using a cold-applied rubberized asphaltic joint sealant. While some difficulty has been experienced in developing a specification for adequate control of quality, the material has been generally satisfactory.

For routing old joints before re-sealing, rugged garden-type tractors were fitted with Turnpike-designed steel plow bits. Various widths of plow bit can be readily interchanged in the tractor harness by releasing a cam-type lock and slipping the new bit into place. Joints are plowed and then blown-out with an air hose before new sealant is applied. Newly-sealed joints are covered with coarse-paper strips to minimize traffic damage and tracking while curing. Small 4-wheel trailers were constructed to house the sealing equipment and material drums so that the entire equipment train could proceed with work progress. For cold-weather work the trailers are equipped with wind breaks and oil-fired salamanders to maintain a workable viscosity in the sealant.

Where edge-sealing or restoration of the bond between concrete pavement and penetration macadam shoulder is required, the joint is flushed with an asphalt emulsion and a stone-chip cover applied. Preceding the inauguration of the full-width shoulder resealing program, a 12-in. wide strip adjacent to the pavement edge was treated throughout the entire length of the Turnpike.

During the winter season temporary repairs to the Portland cement concrete pavement surface are

made with bituminous patching mixtures. Permanent repairs are then accomplished when weather permits. The standard patching procedure usually follows the conventional lines: Saw-cut square edges on the patching area; etch the surface with muriatic acid; paint all faces with neat cement grout; tamp a stiff concrete mix into place; finish to original surface grade and texture; and apply curing cover. Some experimentation has also been done with various bonding materials, including the epoxy resins.

In reporting on maintenance costs for the Turnpike pavement program, it is necessary to preface any statement with the note that 4 summer seasons is too brief a period to establish representative patterns or even repetitive programs. With the experience available to date however the average annual labor and material expenditure is \$85,700 or about \$355 per center-line mile of Turnpike. Of this total, about \$130 per mile is for joint resealing, \$115 for mudjacking, \$49 for repairs and \$61 for cleaning (including degreasing of toll-plaza lanes).

Unit cost data developed from the 1959 program showed 41¢ per pound, applied, for joint sealant and \$174 per location for mudjacking. The unit cost data includes labor, materials and equipment but no supervisory or administrative overhead.

The investment of talent and dollars in constructing the Ohio Turnpike provided a highway of which all Ohioians can be proud. The pavement maintenance program is intended to provide a continuing source of pride for many years to come.

LIMNOLOGY and QUALITY of RAW WATER in IMPOUNDMENTS

CHARLES M. WEISS

Associate Professor of Sanitary Science
and

RAY T. OGLESBY

Research Fellow,

Department of Sanitary Engineering,
University of North Carolina,
Chapel Hill, North Carolina

SURFACE water supplies derived from an impounded stream may have raw water quality characteristics that differ considerably from those generally associated with a flowing body of water of similar origin. Differences result from the characteristic response of impounded water to seasonal heating and cooling. Since the principal transfer of heat occurs in the surface layers, the consequent changes in density in the standing body of water rapidly results in stratification into a multilayered system. Each layer exhibits specific biological and chemical characteristics, the latter in many instances resulting from activity of the former.

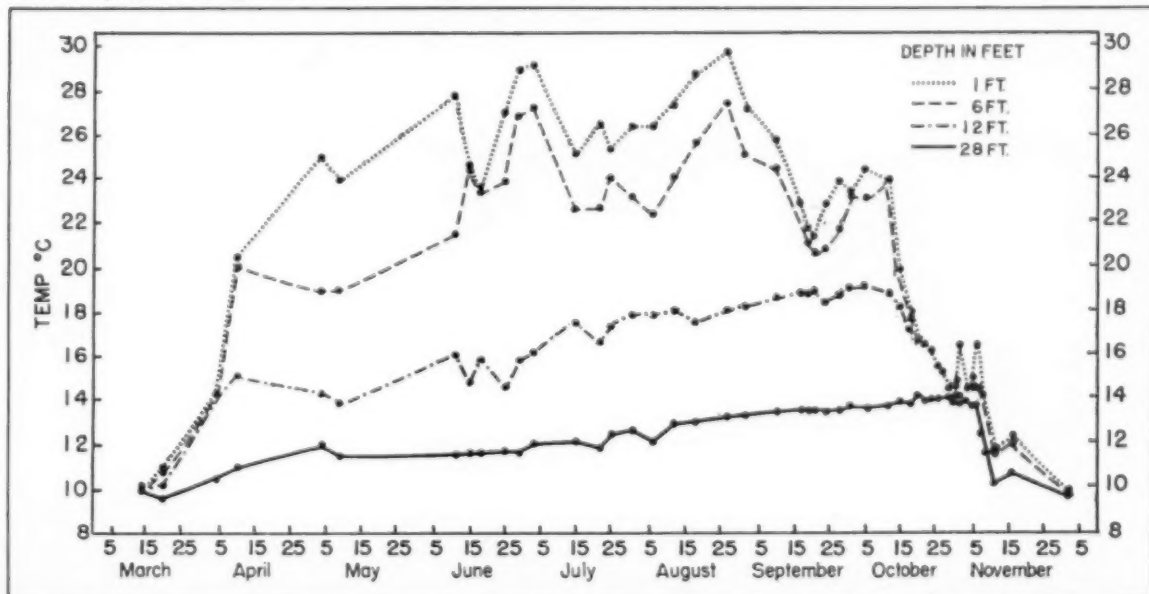
The limnological phenomena in a reservoir produce changes in several

of the water quality parameters that are of concern to water plant operators. These changes may result from mechanisms acting either directly or indirectly. Changes in air temperature and heavy rainfall which respectively produce fluctuations in water temperature and increases in turbidity due to increased runoff can be considered as direct effects. Indirect effects are those chemical parameters which fluctuate in magnitude as a result of biological activity of the aquatic microorganisms. Some of these parameters are dissolved oxygen, pH, CO₂, iron, manganese, nitrate-nitrogen, phosphorous, taste and odor and color. The rates at which biological activities take place are a function of temperature. In turn, the rates of biological activity will be reflected in the changes in the chemical systems directly or indirectly dependent on such activity. The amounts of turbidity in a reservoir may also be of direct significance for those aquatic organisms requiring solar energy for carrying out steps in the process of photosynthesis.

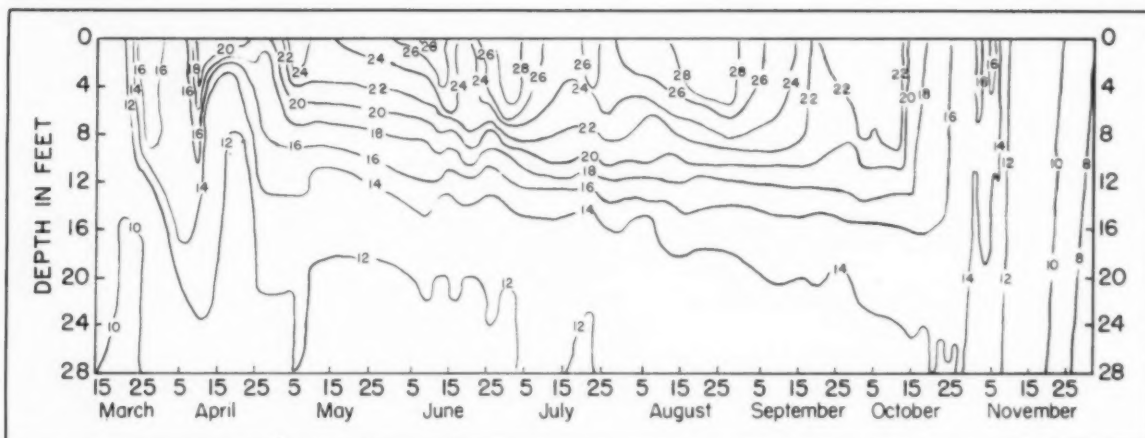
During 1959 a rather intensive analysis of many of the chemical,

physical and biological parameters outlined above was performed on the water of University Lake, the source of water for Chapel Hill, N. C. This reservoir, which drains 30 square miles of agricultural land, contains about 500 million gallons and has a maximum depth of 30 feet at the dam. Early in June, 1959, an unusual taste and odor problem developed in the raw water supply which could not be readily controlled by conventional water treatment procedures. However, by the use of limnological techniques the distribution of the odor in the reservoir was established and steps were taken to avoid the odor-bearing water layers. With a background of data developed from the spring laboratory sessions, detailed studies were carried through the summer and fall to attempt establishment of the interrelationships involved between the various water quality factors previously noted and with particular reference to the problem of taste and odor.

The primary effect of heat exchange between the reservoir and the atmosphere in the period of March to December 1959 is depicted



● FIG. 1. WATER temperatures in University Lake, March to Nov., 1959, showing heat interchanges between air and water.



● FIG. 2. ISOGRAMS of temperature, showing changes with depth and time. Vertical lines indicate a non-stable condition.

in Figures 1 and 2. In Figure 1 the temperatures at four selected depths are presented showing the changes between the homiothermous periods in the spring and fall, when the lake is essentially the same temperature from top to bottom. It is quite evident that the upper layers respond rapidly and directly to the changes in air temperature whereas in the deeper layers the changes are slower and steadier. At 28 feet the fluctuations are almost negligible with the very slow rise in temperature occurring at an essentially uniform rate until the fall overturn late in October.

Temperature data in Figure 2 show the changes of temperature with depth and time. Vertical lines indicate a non-stable condition since the same temperature is found throughout the body of water. Horizontal distribution of lines of the same temperature indicate a strati-

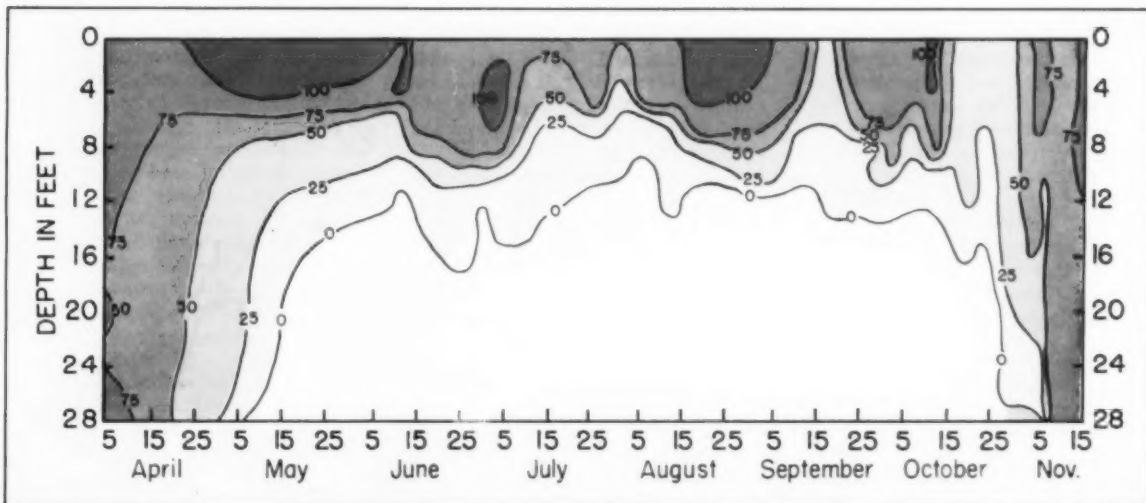
fied or stable situation resulting from the differences in density. Beginning about April 25 the impoundment was stratified, remaining in this condition until about the 10th of October when cooling of the surface waters resulted in downward mixing. The lake became well mixed once more about November 1. Throughout the stratified period the maximum temperature and density change per unit of depth was in the 8- to 12-foot range, having deepened slightly from a shallower zone of 6 to 10 feet in the May-June period.

Dissolved Oxygen Effects

The immediate effect of thermal stratification on a lake or reservoir is to seal off the deep water from the surface waters. Vertical mixing cannot take place through the zone of rapid density change. In the case of University Lake the top

6 feet comprised the surface waters during the summer of 1959. In these circumstances reaeration of the deep water is prevented. Oxygenation by photosynthetic activity is also minimal in the deep water. The available oxygen below the thermocline is rapidly exhausted by the BOD of the naturally occurring organic matter. As shown in Figure 3 this oxygen-devoid condition extended from about May 15 to October 25 and occupied all depths below 16 feet and extended up to the 12- and 10-foot depths for various periods. Only the top four feet were well aerated throughout the summer period.

The availability of high levels of oxygen in only the top four feet of the reservoir appeared to indicate that photosynthetic activity by the phytoplankton was essentially limited to this rather shallow layer of the lake and was generally not



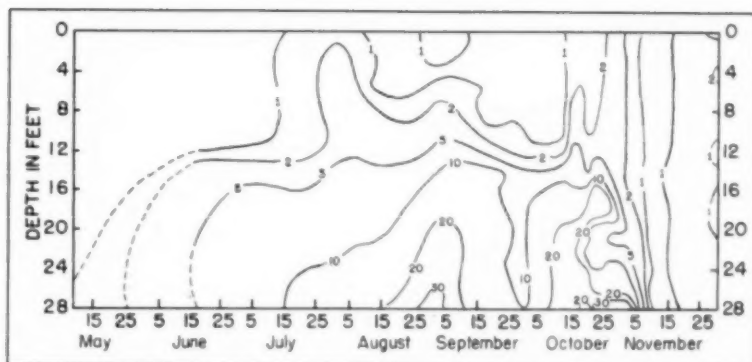
● FIG. 3. PERCENT saturation of dissolved oxygen. Only top 4 feet of the lake were well aerated during summer months.

too extensive. This was in part confirmed by the seasonal distribution of pH. Intense photosynthetic activity with the formation of oxygen consumes sufficient CO_2 to cause a shift in the bicarbonate-carbonate equilibrium and the consequent release of OH^- . This of course results in very alkaline pH's, values as high as 9.0 having been reported in the literature. In soft waters pH values of 7.5 or greater are generally considered due to photosynthetic activity by phytoplankton. The only pH values of this magnitude were noted in the middle of May and again briefly in late June and late September. In all cases these higher pH values were coincident with the higher oxygen saturation values. Below the zone of maximum density change the water was consistently slightly acid reflecting accumulation of CO_2 as a product of the oxidation of organic matter.

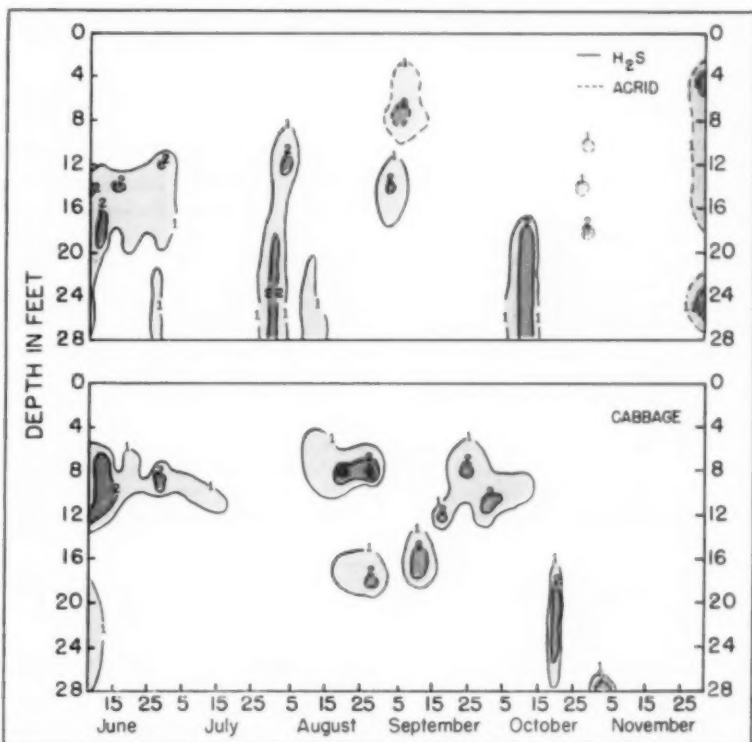
The depletion of oxygen, by biological activity, from the deep water of the reservoir during the summer sets off another chemical reaction of significance to raw water quality. Surface water runoff brings into a reservoir iron in many chemical states. If it is in some particulate form, its removal will take place along with the silt and other coagulable substances. As long as there is oxygen in the water the iron will remain in the ferric state, which is relatively insoluble in water. The bottom muds become a reservoir of iron precipitated in this oxidized state. However, with the absence of oxygen and the development of reducing conditions, the iron is reduced to the ferrous state which is quite soluble in water. A gradual increase in iron then ensues in the oxygen depleted deep water until the fall overturn distributes the iron through all depths of the reservoir. With subsequent reoxygenation of the deep water the iron is reprecipitated. This phenomenon of summer accumulation of iron in the deep water is shown in Figure 4. A maximum value of over 30 mg/L was found in the deep water in August and again in October just prior to the fall overturn. The change from an insoluble state also occurs with manganese as it changes from an oxidized to a reduced form.

Odor

The detection of odor in a raw water supply is at best very subjective, depending on the keenness of an individual's sense of odor as well as application of suitable adjectives for quantitative and quali-



● FIG. 4. INCREASE in iron content of water occurs during summer months and persists until the fall overturn occurs when iron and manganese are reprecipitated.



● FIG. 5 ISOGRAMS of odor for three of the types of odor, cabbage, acrid and hydrogen sulfide. Numbers indicate intensity: 1—slight; 2—moderate; 3—strong.

tative description. It is particularly difficult if a comparison from week to week is desired since no fixed reference in type or strength is available. In the determinations of odor made in the course of this investigation one individual made the primary assessment of type and strength and was checked by a second person. As depicted in Figure 5 odor assessment and description are presented for three of the types that were found in this study: cabbage, acrid and hydrogen sulfide. The odor described as cabbage was striking in its resemblance to boiled cabbage and was the odor problem

which led to this extended study. The numbers in Figure 5 are used to describe relative intensity, e.g., 1—slight, 2—moderate, 3—strong. An odor type described as musty was near universal in all samples not masked by the other odors, but it is not shown in Figure 5 because of its innocuous nature.

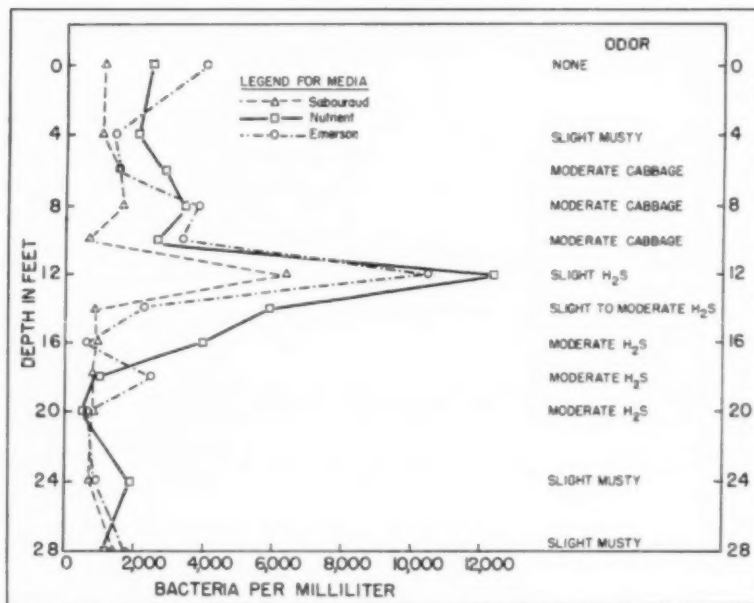
The troublesome cabbage odor had been developing for a week or so prior to initiation of studies specifically concerned with it. In the June occurrence and again in August and September it was primarily located just at or slightly above the zone of maximum temperature or

density change and momentarily deeper at the start of the fall overturn.

In all instances the cabbage odor was confined to a narrow band. Thus it was possible to avoid the odor problem by shifting the water intake to a level where the odor was not present. In this case the intake was raised from a depth of 8 feet to the 2-foot level.

Determination of the cause of a specific odor is invariably beset with pitfalls. Attempts to associate an odor with specific algae, diatoms, protozoa or other microorganisms are extremely difficult because occurrence of any specific form alone is a rarity. Even when the organism dominates a sample, it is difficult to determine whether the organism is the cause of the odor or has grown as a result of the mechanisms which produced the odor.

The peculiar characteristic of the cabbage odor, its resistance to removal by high dosages of activated carbon, the absence of any unusual members of the plankton forms normally associated with odor, and its peculiar localization in the reservoir led into an investigation of other possible odor-producing factors including bacteria and actinomycetes. The vertical distribution of bacteria on June 11, as determined by total counts on three different media is shown in Figure 6. Sabouroud and Emerson agars are formulated for optimum growth of fungi and actinomycetes respectively whereas

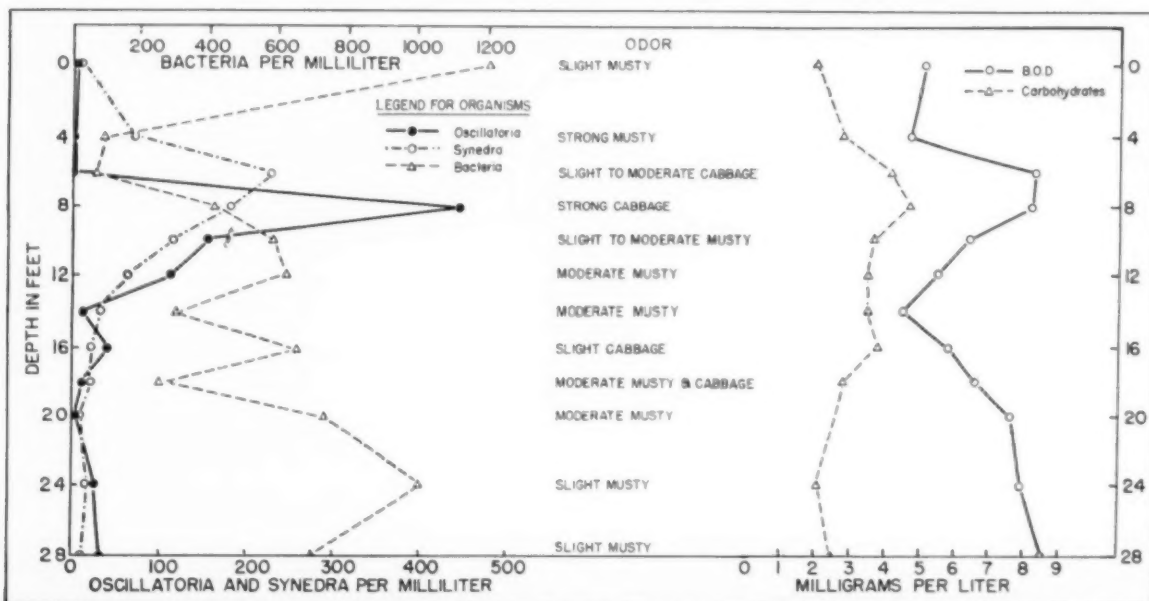


● FIG. 6. VERTICAL distribution of bacteria and relationship to various types and intensities of odors. Curves show results of examination using three media.

nutrient agar is used as a general all-purpose media. The numbers of colonies that could be readily identified as being either fungi or actinomycetes were insufficient to establish group differences at the various levels sampled but the bacterial colonies on all three media show a distinct and marked peak in number just at or at the lower edge of the zone of maximum density change. This localized bacterial con-

centration may have resulted from utilization of the organic molecules associated with the cabbage odor as an energy source or the bacteria could have been producing the cabbage odor as a result of their metabolic activity.

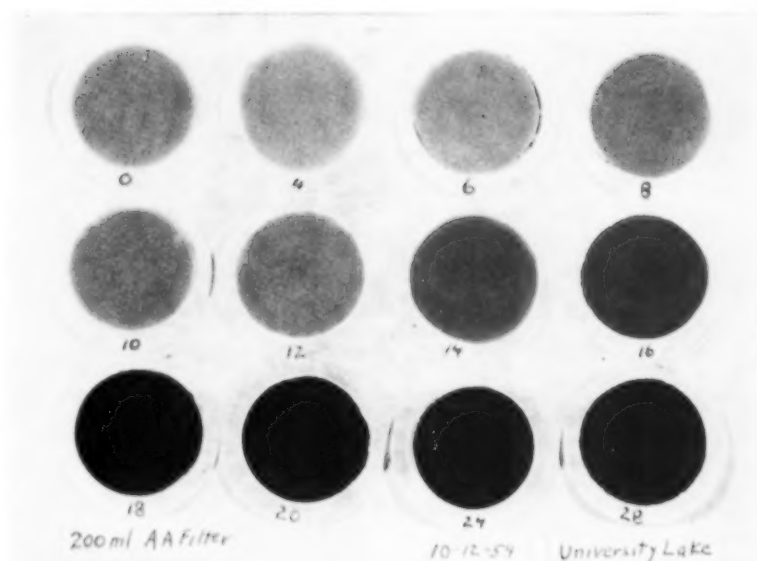
With a recurrence of the cabbage odor in the 6- to 10-foot layer in August the vertical distribution of microorganisms and associated factors were studied in detail once



● FIG. 7 (left) and FIG. 8 (right). Relationships of types of organisms and odors are shown in Fig. 7. Peaks of diatoms, blue-green alga and cabbage odor coincided in top 12 ft. of water with distribution of BOD and carbohydrates, shown in Fig. 8.

more. At this time a diatom of the genus *Synedra* and a blue-green algae of the genus *Oscillatoria* were present in sufficient numbers to record systematically. Their vertical distribution as well as the total bacterial numbers on August 18 are shown in Figure 7. In this case both *Synedra* and *Oscillatoria* show peak numbers in the layer associated with the cabbage odor and the bacteria a minimum number. However, the association of the diatom and blue-green algae with the layers of strong odor was probably one of effect rather than cause. Both forms have been noted as being found in waters generally high in organic content. Comparison of Figures 7 and 8 shows that the three peaks, diatoms, blue-green algae, and cabbage odor, coincided in the top 12 feet, with the distribution of BOD and carbohydrate. The high BOD of the deepest water represents the accumulation of organic detritus during the period of summer stratification but does not appear to include the same amount of carbohydrate or carbohydrate-reacting materials detected at the 6- to 8-foot level.

In a further attempt to derive a more quantitative statement between the presence of odor in the reservoir and associated biological activity a procedure of plant pigment extraction was initiated. This consisted of filtering 200-ml samples from each depth through AA membrane filters. The total particulate matter collected on the filter was then extracted with 5 ml of 95 percent acetone for 48 hours in a refrigerator. Centrifugation removed the non-soluble fractions and the color of the supernatant, primarily due to chlorophyll, was determined in a Klett-Summerson photometer with a No. 64 filter (red). This



● FIG. 9. MEMBRANE filters with material filtered from 200 ml samples. Numbers by each indicate the depth in feet at which sample was taken. Note data in Table 1.

rather wide band filter passes light that includes peaks in the absorption spectra of the chlorophylls. Photometer readings, while only relative, are proportional to chlorophyll content.

The vertical distribution of both plant material and other particulate matter when collected on the membrane filters vividly illustrates the non-homogeneity of a stratified lake. The precipitation of oxidized iron on the filters from the deep samples is readily evident. Table 1 presents the values for chlorophyll and iron obtained from the samples collected on several days and from various depths of water.

The sets of membrane filters and their associated data provide several points for discussion. Although soil turbidity in the water collected

on the filters and the precipitation of iron from the deep samples tended to obscure the color of the filtered green pigmented forms, the peak values at 6 and 8 feet on September 10, 10 feet on September 17 and at 10 feet on October 12 showed up well. However, on October 12, the highest chlorophyll value at 12 feet was apparently masked on the filter by the particulate iron at that level.

The samples of September 10 and 17 provided an opportunity to associate odor with the chlorophyll extract and in both cases peak odor was associated with chlorophyll minima. Chlorophyll maxima occurred above or below the odor levels. It is clear that the chlorophyll-bearing plankton were not the direct cause of the cabbage odor.

Limnological investigations can be useful in water supply operations and in the design of new facilities. In the example described, the immediate solution of the odor problem was to construct an intake at a depth at which the odor was not found. Although deeper water would have provided essentially odor free water and colder water, the high iron and manganese content would have necessitated additional or modified treatment. However, by selecting an intake level at two feet, both odor and iron problems were bypassed.

This study was greatly facilitated by the interest and cooperation of Max D. Saunders, Superintendent of the University Water Filtration Plant.

Table 1—Iron and Chlorophyll Values in Depth Samples

Depth ft.	September 2		September 10		September 17		October 12		November 2	
	Iron(a)	Chloro- phyl(b)	Iron	Chloro- phyl	Iron	Chloro- phyl	Iron	Chloro- phyl	Iron	Chloro- phyl
0	1.7	8	...	17	0.8	15	0.4	23	1.5	25
4	0.8	14	...	17	0.8	12	0.3	21	1.6	19
6	1.7	17	...	27	1.1	9	0.3	13	1.7	21
8	2.0	12	...	26	0.8	13	0.3	19	1.5	18
10	2.5	24	...	23	1.3	19	0.4	20	1.5	17
12	7.0	22	...	22	4.8	14	1.6	31	1.4	18
14	8.5	23	...	16	12.1	8	8.4	25	1.6	17
16	...	18	...	15	12.1	6	13.1	21	1.6	17
18	19.6	18	...	16	11.8	4	17.8	15	2.9	16
20	20.8	15	...	13	11.7	3	23.8	12	3.5	16
24	23.5	17	...	10	11.7	5	24.0	11	6.6	10
28	30.5	11	...	14	11.6	8	26.6	14	31.0	23

(a) Total Iron—mg/l.

(b) Klett reading on 5 ml. acetone extract with No. 64 filter, 12 ml. cell.

SQUAW VALLEY FRINGE AREA SEWAGE TREATMENT PLANT

PHILIP NOEL STORRS
Roy Edwin Ramseier and Associates,
Berkeley, California

THE EFFECT of fourteen million dollars on a small, relatively unknown resort area with a permanent population of about one hundred people can be tremendous. That small resort area was Squaw Valley, California, in 1957, and the fourteen million dollars was the sum to be spent to make Squaw Valley the site of the 1960 Winter Olympic Games.

Our client, the Squaw Valley Land and Livestock Company, was planning a commercial area to satisfy the coming need in the Valley for small shops, a post office, restaurants, motel accommodations, etc. Early in 1957 we began planning for the disposal of sewage from these facilities.

For years all the homes and the Squaw Valley Lodge had used septic tanks and leaching fields to dispose of their sewage. This solution was not adequate for the Valley Commercial Area, and was totally inadequate for the facilities envisioned by the Olympic Organizing Committee. Consequently, the Olympic Organizing Committee planned a complete treatment plant within the Olympic area.

It seemed logical to us that it would be preferable to dispose of the sewage from the commercial area by pumping it to the Olympic plant, rather than to construct another treatment plant, especially since the commercial area plant would probably have to be placed near the main entrance to the Games area. After discussing this with the Olympic Organizing Committee for several months, we were told that their treatment plant's capacity of 500,000 gallons per day would be necessary for the Games, and that

they would be unable to accept any sewage from outside the Olympic area.

After considering several possibilities, we were forced to the conclusion that a treatment plant would have to be constructed for our client. Economy and accessibility dictated that the plant be close to the commercial area and adjacent to a road. The only location that would satisfy the requirements was less than one hundred feet from the entrance road to the main spectator area for the Games.

At this time the commercial development proposed consisted of a restaurant, six to ten shops, and fifty to one hundred motel units. Although we were considering treating a relatively small amount of sewage, the consequences of failure would be serious. Not only did we have to satisfy our client, but also the State and County Health Departments and the State Water Pollution Control Board. The Olympic Organizing Committee was particularly worried, since we were proposing a sewage treatment plant so near to the entrance to the main spectator area. We realized that any plant constructed would have to be absolutely unobtrusive to sight, smell or hearing.

Preliminary Estimates

A real problem arose when we sat down to determine design flows and loadings. The shops presented no problem, since flow from them would be negligible. But how many people would be packed into the motel units during the Games? Were they all going to take three long, hot showers a day? Data for motels are readily available, but not for motels during Winter Olympic Games! The restaurant was a similar problem. No one was willing to commit himself to how many tables

there would be, let alone how many meals per day would be served.

We finally estimated the restaurant patronage at 300 meals per day, with a sewage flow of 3,000 gpd. For 50 motel units the guess was a sewage contribution of 150 gallons per unit per day or 7,500 gpd for all units. For six shops the total estimate was 150 gpd. Thus, a grand total average daily flow of 10,650 gpd was envisioned.

Since the restaurant and shops were to be constructed first, we would have an opportunity to determine just what loading the restaurant would place on the plant. If necessary, we could then revise our estimates of the probable total load.

We filed a "Report on Proposed Waste Discharge" with the State Water Pollution Control Board. Their requirements for our plant and its effluent were as follows:

1) Any effluent reaching Squaw Creek or a usable ground water stratum must meet United States Public Health Service drinking water requirements.

2) In the effluent the biochemical oxygen demand, the turbidity, and the suspended solids must not exceed 10 milligrams per liter. Ether-soluble materials must not exceed 15 mg/L, and settleable solids must not exceed 0.2 mg/L.

To these rather rigid requirements, circumstances forced us to add our own requirements:

1) The plant must be simple and foolproof to operate. Maintenance would be part-time and unskilled.

2) The plant should be pre-fabricated as much as possible. Because of the large-scale construction programs under way all over the Lake Tahoe area, labor was almost impossible to obtain, and was extremely expensive.

3) The plant should be salvable with a minimum of cost. There was the strong possibility that after the Olympic Games we could connect to the Olympic sewerage system. If this came about, we would want to be able to salvage the plant and construct a pumping station in its place to lift the sewage from the commercial area into the Olympic sewers.

4) The job had to be done quickly. It was October, and heavy snows could be expected any time after Thanksgiving. The restaurant was to open in December, so we could not delay construction until Spring.

5) The plant would have to be weather-proof and covered. Everything would have to function per-

fectly, not only with a normal four to five feet of snow, but also under possibly 12 to 15 feet of snow.

Our first problem was to determine what to do with the plant effluent. In view of the stringent requirements, we decided to treat it on an intermittent sand filter. However, a sand filter would require an effluent of excellent quality from the treatment plant, if it were not to plug up and cause odors and maintenance problems. We located the filter about one thousand feet from the plant, on the south slope of the Valley. There the soil percolation was excellent, and the location was sufficiently removed from the public in case of trouble.

Plant Design

Consideration of all the factors involved led us to decide upon complete aerobic oxidation of the sewage. This treatment would eliminate sludge handling problems, would be odor-free and would nearly eliminate operating problems. Because of the necessity for speed, and the labor problem, we used a Chicago Pump Company Rated Aeration unit for the primary oxidation component of the plant. This unit consists of a fabricated steel aeration tank, with a cross-flow clarifier at one end. Sludge is returned to the aeration tank by an airlift from the clarifier bottom. The sewage is comminuted before it enters the aeration tank.

The dimensions of the aeration tank are 18'6" by 9'3", with a water depth of 9'0". The settling compartment is a double hopper with top dimensions of 9'3" by 6'10". A "Chicago" No. 7B comminutor is used.

The clarifier effluent flows into a sump, three feet in diameter and nine feet deep. Two centrifugal pumps, controlled by electrodes in the sump, lift the effluent across the

Valley onto the filter, through a three-inch plastic force main. These pumps will normally operate one at a time. However, if the effluent in the sump rises high enough to turn both pumps on, the piping is arranged so that they will pump in series to empty the sump quickly. The pumps are protected from freezing by electrical heating tapes which are wrapped around the suction and discharge piping.

There is a float switch near the top of the sump. This switch is wired into an alarm box which is placed in a nearby residence where someone is always present. The alarm box has a fail-safe circuit so that it will ring in the event of either high water in the sump or power failure. At the plant there is a stand-by gasoline engine pump to be used during an extended power outage.

The filter shell consists of a trench 6 feet wide and 190 feet long, following the contour of the hill. This size allows an average loading of about 10 gallons per square foot per day. In the trench we placed 12 inches of sand. In order to protect unwary skiers, the trench was covered with 2-inch-thick planks. During the winter the snow completely covers the filter, and there is no evidence of it at all to mar the appearance of the slopes.

With the design problems solved, there now remained the matter of construction of the plant. Winter construction of even small projects in the High Sierra is difficult at best. If, in addition to the December weather, you are working with unskilled day labor, uncertain material deliveries, and inadequate equipment, in between snow storms, it can be aggravating.

In order to protect the plant and to disguise its function, we designed a low, shed-roofed building. The building is of post and beam construction,

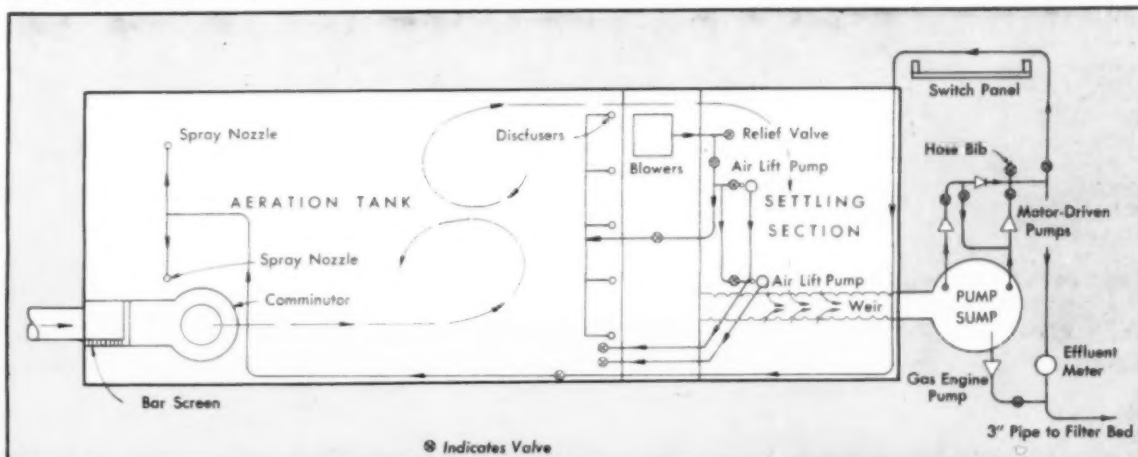
with plywood panels. Since it was necessary to support the building on newly-filled soil, the posts are set on jacks to take care of differential settlement. The building is designed so that, should an additional treatment unit be required, it can be installed beside the existing unit and the building extended over it. The entire structure is constructed so that it can be dismantled and reassembled with a minimum of effort.

The operating problems have been minor. Within about two weeks after the restaurant was connected to the sewer, the surface of the aeration tank was half covered with grease balls. Investigation revealed that the restaurant's grease trap was properly installed, but the sink drains all by-passed it. When this was corrected, the grease problem was greatly minimized.

Since the motel units were not constructed as planned, the plant was quite underloaded prior to the Games. The low solids in the aeration tank, plus the excessive amount of detergent from the restaurant resulted in a foam problem. Almost every morning there would be about six feet of foam completely blanketing the unit inside the building. We were able largely to eliminate this by arranging the air lift discharges so that they sprayed return sludge over the area where the foam was being generated, and by controlling the air blower with a time clock set so that the blower operated about 20 minutes each hour.

The plant has performed successfully. At no time has there been any odor discernible at the plant or at the filter. A measure of our success was furnished recently when a permanent resident of the Valley who had passed by the plant almost daily confessed that she didn't know what that "cute little building" was for.

● SCHEMATIC layout of the compact sewage treatment plant built to serve commercial area at the Winter Olympics site.



"Do-It-Yourself" STREET SWEEPING PROVES LOWEST IN COST

Study of street sweeping costs by a newly incorporated city points to the economy of municipally owned and operated equipment; experience proves that these original cost estimates were accurate.

E. FREDRICK BIEN
City Administrator,
Norwalk, California

THREE TYPES of street sweeping operations can be found in Southern California: (a) City owned and operated, (b) contract service from another governmental agency, and (c) contract service from private enterprise. The curb mile cost varies considerably from method to method. This variance is understandable when local factors such as general street conditions, location of disposal sites, kind of equipment used and wage scales are considered.

The City of Norwalk, California, (pop. 83,010) was incorporated on August 27, 1957. In an area of 10.5 square miles, there are approximately 275 curb miles of streets. In September, 1958, in response to citizen requests, the City Council decided upon an increase in the level of street sweeping service. Residential streets were to be swept once each week and commercial streets and major arterials three times a week. Since it was not known which of the several types of service would be the most economical, sweeping specifications were prepared and proposal forms were mailed to prospective bidders. In addition, the County of Los Angeles was asked to

submit a "courtesy" bid for Council consideration.

The proposals received from qualified private contractors ranged from a low of \$44,784 (\$3.06 per curb mile) to \$56,712 (\$3.35 per curb mile). The proposal submitted by the County of Los Angeles was \$62,712 (\$3.60 per curb mile). All proposals were on an annual basis.

Because of the wide divergence of the proposals, the Council requested a study to be made of the cost of a municipal street sweeping program utilizing City-owned equipment operated by City personnel. This study determined that the City should be able to conduct its own street sweeping program at a cost of ap-



● FIRST pieces of equipment purchased by Norwalk were these two sweepers. Author, left, points out special features.

proximately \$2.01 per curb mile. On the strength of the facts shown in the study, and the recommendation of the City Administrator, the City Council in October, 1958, authorized the establishment of a City operated street sweeping program. Shortly thereafter, two 3-cubic yard Mobil Sweepers were purchased at a cost of \$17,573.92; personnel were hired and the new City activity was under way.

After a full year of operation, an analysis was made of the cost and the service factors of the City's street sweeping program. The analysis proved to be enlightening and encouraging, particularly in light of the fact that some of the local private contractors, and others, had said that the cost estimate of \$2.01 per curb mile was unrealistic. The total cost of the first year's operation, October 1, 1958 to September 30, 1959, was \$31,586.88. During this period, 15,512 curb miles were swept. Travel to and from the dump site added 5,934 miles to the operation as "dead runs." (Street sweepers are equipped with Tachograph so accurate records of daily operation can be obtained.)

A summary of the operating costs for the first year are presented in Table 1. Actual cost is therefore computed at \$2.036 per curb mile.

Table 1—Costs of Street Sweeper Operation

Salaries and Wages	\$11,908.71
Workmen's Compensation	254.85
Administration Overhead @ 15% (not an actual dollar expenditure)	1,786.30
Total Salaries and Wages	\$13,949.86
Maintenance and Operation (including garage rental @ \$2160.00 and Liability Insurance @ \$183.06)	14,122.24
Capital Outlay	
Equipment Amortization 1/5 of \$17,573.92	3,514.78
Total Street Sweeping Cost—1 year	\$31,586.88



● SWEEPING crews take pride in their work and city operation has resulted in substantial savings over other methods.

The effectiveness of the City's first year of operation can be measured by the following facts:

1) City owned operation has resulted in a saving of approximately \$30,000 over the City-County contract method previously used.

2) The number of "service satisfaction" calls has increased both in calls received at City Hall and at the Norwalk Chamber of Commerce.

3) A marked decrease in the number of service complaints has been evidenced.

4) A renewed "pride of community" has been reported by street sweeping crews.

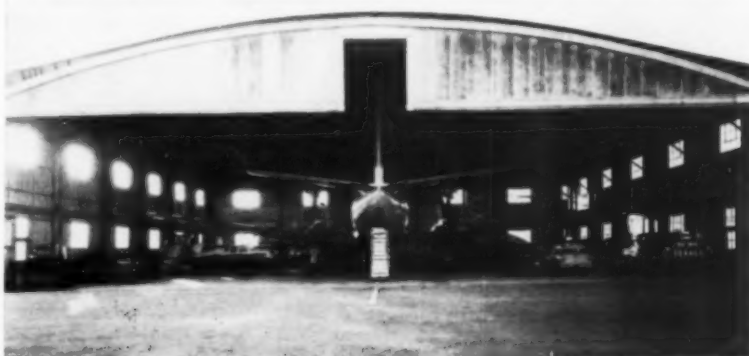
HANGAR MODIFICATION THWARTS STEEL STRIKE DELAY

JOHN K. BRIGHT
Chief Design Engineer
Harold E. Rist, Associates
Glens Falls, N. Y.

EASTERN AIR LINES now has hangar space at the Warren County (New York) Airport, thanks to the modification of an existing structure on the airport grounds at a cost considerably below that for erection of a new hangar. Eastern regularly deadheads aircraft each night at Warren County for a return flight in the morning to New York. During the summer season they were able to leave these aircraft on the aprons. However, during the winter commencing about November it was necessary for them to fly the aircraft back to Albany after landing in Glens Falls so they could

have heated storage facilities for the planes overnight. In the morning the planes would have to fly back to Glens Falls, and from there, to New York again. To eliminate this shuttle,

Eastern asked Warren County to provide a hangar for them on a lease basis. The criteria aircraft was a Martin 404 with about a 99-ft. wing span and a 28-ft. tail height.



● RIGID FRAME arch, just visible on roof, allowed cutting of bowstring truss to provide entrance space for aircraft with 28-ft. high tail and use of existing hangar.

When Eastern first broached the subject with county officials and gave Martin 404 size requirements it was a foregone conclusion that a new hangar or at least an extension would be necessary. The existing hangar dimensions precluded its use by any of Eastern's stable of aircraft. The hangar at that time had a vertical clearance of about 20 feet to the trusses. The trusses were 10-ft. deep bowstrings. Harold E. Rist, Associates, consulting engineers, advised the county that they thought they could design an addition to the hangar which would take the Martin tail section. Accordingly, the engineers prepared plans for a hangar extension and the plans were sent out for bids just as the 1959 steel strike settled in.

Only one bid was received and it was rejected as being far above the estimate. With a cold weather deadline to meet if Eastern was to be accommodated, the engineers decided to modify the design by cutting the existing steel bow-string truss and picking up its load with a rigid frame thus providing for tail clearance inside the existing building. A second truss also required



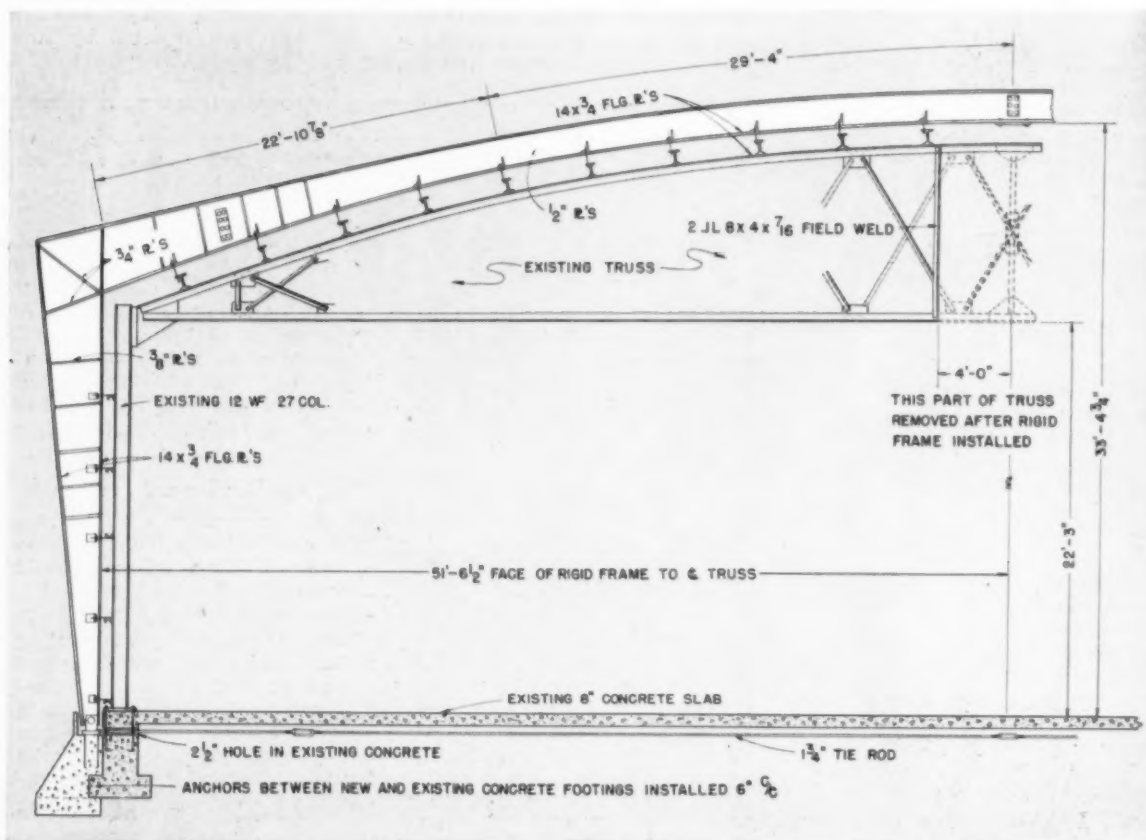
● AERIAL of plane required modification of the second truss. Note X-shaped construction just above tail section.

cutting to half-depth to clear the aircraft's aerial. The redesigning was tailored to utilize available steel in the area so that construction could proceed. Anticipating the onset of freezing weather, the contractor expedited the placement of the foundations as soon as a contract was awarded and got an o.k. for steel erection just three days after the final foundation pour. Once the rigid frame was positioned, adjustable connections were made to the existing columns and truss. Steel brac-

ing was simultaneously welded into the existing second truss and lateral and longitudinal bracing installed. On December 2, thirty days after redesign was started, the old trusses were cut with no measurable drop in roof alignment and the hangar was then usable by the larger aircraft at one-third the cost of an addition.

Included in the project was the installation of an engine heating system for the aircraft, electric track snow melting for the doors and an electrically operated overhead tail door. Since completion, the hangar has been in operation every night. Both the user, Eastern Air Lines, and the authorities of Warren County have nothing but praise for the operation of the job and feel that they have saved considerable money. Additional hangar facilities will most likely be built in the near future to take even larger aircraft.

The contractor on the project was Adirondack Construction Corp.; steel fabrication and erection was handled by Schenectady Steel Co., Inc.; Paul Russell is airport manager; Ed Barrett is representative for Eastern Air Lines.



● STEEL locally available during strike was used to fabricate rigid frame which carries load, allows truss to be cut.

SANITATION COSTS Cut 31%

Cost-conscious supervision and use of paper bags as garbage can liners gives Fredericksburg, Virginia, an improved refuse collection service at a lower cost.

CLIFFORD RUSCH
Administrative Assistant
Fredericksburg, Virginia

VIRTUALLY every municipality is facing increasing costs and demands for added services while revenues remain relatively constant. To cope with this problem, Fredericksburg, Virginia, has made a constant effort to reduce costs, and our experience indicates that significant economies can be achieved in refuse collection and disposal operations.

Fredericksburg's sanitation department expended almost \$71,000 in the 1953-1954 fiscal year. This year the department will cost only \$49,000—a 31 percent decrease which was achieved while increasing collection services and despite higher material costs, wage increases, the initiation of paid vacations and the replacement of open dumps with sanitary landfills. This reduction stems from cost-conscious supervision and the recent initiation of a unique refuse collection system which utilizes paper bags as garbage can liners. These two factors have led to a reduction of sanitation department personnel from 23 to 6 employees.

Because the sanitation department is often the orphan among municipal services, a chronological description of our efforts may aid other cities.

Original Collection System

In the 1930's, L. J. Houston, Fredericksburg's city manager until his retirement in 1955, initiated the can exchange system of refuse collection. At each collection, the city furnished a clean garbage can and burlap trash bag and transported the full can and bag to an incinerator where they were emptied and the cans were washed. Rear door collections were made three times a week during the summer and twice

weekly at other times. Employees worked a task system rather than fixed hours and left when their daily route was completed. In those days of low wages, the can exchange system provided an economical and unusually sanitary service.

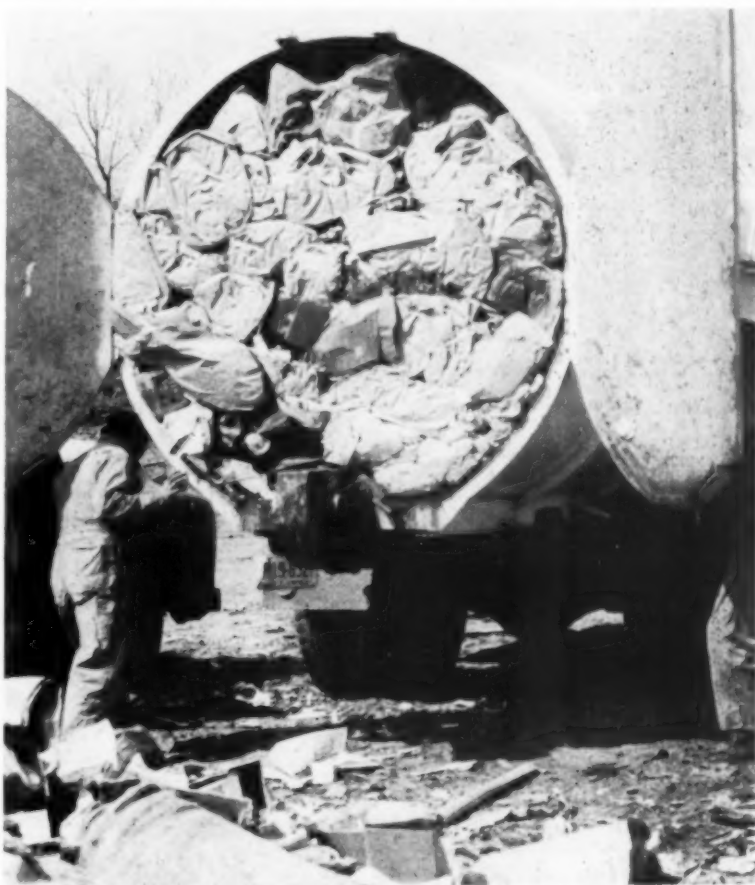
A Growing Problem

Following 1945, sanitation expenditures grew as the amount of refuse increased. Despite the initiation of

service charges for refuse collection in 1951, the growing gap between expenditures and refuse collection revenues added to the strain placed on city finances by rising costs and the extension of services to annexed areas.

Mr. Houston took steps to correct the situation and reduced the sanitation department's unnecessarily large work force from 23 to 18 men and cut the cost of operations by \$14,500 in the 1954-1955 fiscal year.

Good immediate supervision was provided when F. Freeman Funk, who had become City Manager in 1955, assigned his assistant, Charles



● WELL-COMPACTED load of paper bags and refuse is discharged at the disposal area from one of the Pak-Mor trucks. Greater truck capacity has helped cut costs.



● WHEN metal cans were used, 75% of the weight was represented by the containers. This man carries garbage in the paper bag, refuse, bottles, etc., in burlap sack.

Sharp, to supervise the sanitation department. Mr. Sharp concluded that the department was still overstaffed and he reduced the department to 11 employees. Clarence Hubble then assumed temporary supervision of the department and reduced departmental expenditures to \$49,371 during the 1956-1957 fiscal year—a reduction of \$21,000 from the expenditures during 1953-1954.

Remaining Problems

In 1957, the writer was appointed administrative aide to the City Manager and assigned the supervision of the sanitation department. The 1957-1958 budget increased departmental costs by \$5,000 by granting wage increases and initiating sanitary landfill operations to replace open dumps. However, this cost was partially offset by economies achieved during the year, and experience indicated that additional savings could be achieved by alleviating two types of problems.

The first set of problems included inefficient routing, abuses of sick

leave, frequent truck breakdowns, excessive customer complaints and employees who could perform only one type of work.

Secondly, the can exchange system, while exceptionally sanitary, was expensive because of the limited capacity of the rack type trucks and the multiple loading and unloading operations required. The can exchange system necessitated continued incinerator use although the sanitary landfill was 100 yards away. The incinerator provided hot water for washing the garbage cans, and the building housed the wash racks, pumps and pressure tanks.

Because any basic change in our collection system would require detailed studies and legislative authorization, we first concentrated on improving the efficiency of existing operations while studying alternatives to the can exchange system.

Administrative Improvements

1) **Route Revisions:** The daily collection routes often required an individual crew to collect refuse in

several sections of the city, and the work loads were unequal. After consultation with each crew, daily routes were rearranged and made contiguous. Counts were made of the garbage cans serviced on each route, and route adjustments balanced the crew work loads.

2) **Reducing Absenteeism:** The sanitation department was averaging almost 10 percent lost time because of sick leave, largely because several employees were chronic absentees. These employees were warned, and when their absences continued, spot checks of their homes and "hang-outs" conclusively proved abuses of sick leave. Several employees were discharged, absenteeism was greatly reduced, and, surprisingly, the morale of the remaining employees improved.

3) **Increasing Flexibility:** Because we provide rear door service and do not service each residence, the collection crews must be completely familiar with each route. Absences caused difficulties because the personnel reductions had eliminated substitute collectors, incinerator workers were physically unable to work as collectors, and replacements borrowed from other departments were unfamiliar with the collection routes. This problem was alleviated by transferring employees physically unable to collect refuse, dismissing those abusing sick leave, and hiring incinerator workers who were physically fit for training as refuse collectors. Absent collectors were replaced by incinerator workers, and, by increasing our supply of clean garbage cans, the collection crews could continue their operations although the understaffed incinerator crew fell behind in their work. The department could now operate even when 50 percent of the regular refuse collectors were sick.

4) **Minimizing Equipment Repairs:** Two new trucks were purchased, the third truck was put in good condition, and a preventive maintenance program was initiated. These steps virtually eliminated expensive equipment repairs, the disruption of work by equipment breakdowns and the resulting overtime pay.

5) **Reducing Complaints:** The number of complaints was reduced by having trained collectors available as substitutes for absentees, but some complaints resulted from the men hurrying to complete their work. This, the only undesirable characteristic of the task system, was corrected by requiring each crew to work all complaint orders

on their route before the end of their work day.

By 1958, it seemed unlikely that any large additional economies could be realized while operating the can exchange system. Because the refuse collectors could leave work when their route was completed, they worked rapidly without the need for constant supervision to prevent malingering. Although collectors worked only 36 of the 48 hours for which they were paid weekly, each three-man crew averaged 415 rear collections daily. This was a good work load since the can exchange system required twelve separate loading, unloading and carrying operations to service a customer at each collection. Despite wage increases, the initiation of a sanitary landfill, and the purchase of two new trucks, labor costs had been lower than in any immediately preceding year, and the department's total expenditures were still lower than previously.

A New Approach

Previous study indicated that the best opportunity for significant savings lay in closing the incinerator and disposing of all refuse in the sanitary landfill. However, to be efficient, the work of unloading the trucks, dumping the garbage cans, washing the cans, and reloading the trucks had to be performed at the refuse disposal site. Because landfill sites change, and, because it seemed impractical to provide portable facilities for dumping, washing, draining and storing large quantities of garbage cans, we became interested in the use of duplex paper bags as garbage can liners. The liner filled with refuse would be removed at each collection and replaced by a new paper bag. By eliminating the need for washing garbage cans, the incinerator could be closed.

In 1958, a study of collection operations was conducted with the assistance of the Union Bag-Camp Paper Corporation. The resulting report furnished detailed data on labor, material and equipment costs; the weight of refuse collected; and the amount of personnel time and equipment usage for various operations. Summarized, this study highlighted the following major defects of the can exchange system:

- 1) The multiple handling operations for each garbage can at each collection required collectors to lift and carry 234 tons weekly to remove 53.4 tons of refuse from homes.
- 2) The limited truck capacities made collectors spend 35 percent of

their working time loading and unloading garbage cans at the incinerator and in driving to and from the route. The average distance from the route to the dump was about 1.7 miles.

3) Can washing, an integral part of the can exchange system, necessitated the use of the incinerator to produce hot water and to house pumps, tanks, heating coils, and accessories. Incinerator operations cost almost \$18,000 annually and repairs were needed.

Based on these facts, the report recommended discontinuing the exchange and washing of garbage cans at each collection; initiating the use of duplex paper bags as garbage can liners; closing the incinerator; disposing of all refuse by sanitary landfill; and replacing rack type collection trucks with modern packer units.

A field test was conducted to verify the projected labor savings, to test the bags and to obtain customers' reactions. During a five-week period, 1,100 paper bags,

which were furnished by the Union Bag-Camp Paper Corporation, were used on the regular collection routes. Despite freezing and rainy weather, only 8 bags tore when removed from the garbage can, and only 7 of the 78 customers contacted expressed a preference for the old can exchange system.

In June, 1959, the City Council authorized the new system and two 20-cubic yard, Pak-Mor collection bodies and a carload of paper bags were purchased. A pamphlet was prepared and mailed to every customer. This pamphlet explained the reasons for the change, listed the liberalized collection regulations, and, with the aid of photographs, showed how to obtain the full benefits of the new refuse collection service.

To initiate the new system, each customer received either a new or thoroughly cleaned and sterilized garbage can with the paper bag liner. Reconditioning the used garbage cans was more difficult than anticipated; apparently even hosing



● PICK-UP men work ahead of the collection truck, placing piles of paper and bur-lap sacks at the curbside. The city now averages 170 pick-ups per day per man.

Refuse Collection & Disposal Costs, Fredericksburg, Virginia

Fiscal Year	Total Cost	Labor Cost	Adjusted Cost (a)	No. of (b) Customers	Cost Per Customer
1953-1954	\$70,686	\$59,215	\$62,984	2,911	\$21.56
1954-1955	56,265	47,235	49,872	2,815	17.71
1955-1956	56,471	47,331	49,179	2,763	17.80
1956-1957	49,371	38,948	45,119	2,713	16.63
1957-1958	52,084 (c)	36,383	45,638	2,670	17.09
1958-1959	54,349 (d)	37,198	47,389	2,581	18.36
1959-1960 (est.)	49,000	24,200	42,200	2,540	16.61

- (a) Adjusted cost equals total cost less expenditures for disposing of refuse delivered by private haulers, business, etc.
 (b) The decline in city customers results from increased service charges and the free disposal of refuse delivered by private collectors who can thereby service most multiple family dwellings for less than the city charges.
 (c) During the year, a new truck was purchased, limited sanitary land fill operations begun, and wage increases granted.
 (d) Wage increases were granted and the first full year of limited sanitary land fill operations took place during this period.

each can with scalding water after each collection had not made the can exchange system as sanitary as we had believed. The discoloration of the cans, which we had thought was a combination of stains and metal oxidation, proved to be a thin, exceptionally hard layer of grease and dirt. Neither determined scouring with steel wool and a cleansing solution which could remove paint or applying the cleanser with a high pressure steam jenny could clean many of the cans satisfactorily. Over one-half of the 3,000 cans previously used were disposed of.

Multiple Benefits

Nearly a year of operating the new system of refuse collection and disposal has indicated the following:

1) Packer trucks have permitted the removal of more refuse from each home at each collection, and special monthly collections of large amounts of trash are now made as an additional service. Rear door service is still provided thrice weekly in the summer and twice weekly at other times.

2) The duplex paper bags have proved exceptionally durable. They are 22 inches in height and diameter, are constructed of wet strength Kraft paper and cost 4¢ each. The bags fit the 10 gallon garbage cans snugly, and, when garbage is drained and placed inside the can liner, the cans will stay clean almost indefinitely. The city continues to furnish a garbage can and burlap trash bags to each customer.

3) A 75 percent reduction in the weight handled by collectors, and the use of trucks which require fewer trips to the dump for unloading has permitted reducing the collection force from 9 to 8 men during

the summer, and from 6 to 5 men during the balance of the year. When a truck is fully loaded, the driver takes it to the dump while the collectors remain on the route and continue to replace the full paper liners and trash bags with new can liners and burlap bags.

The refuse is placed at the curb until the collection truck returns.

4) Despite fewer collectors and a correspondingly increased work load, a three-man crew averages over 500 rear collections daily, and the collectors work only about 33 hours per week.

5) Enclosed packer bodies have reduced street litter and their low loading heights have eliminated back injuries.

6) The use of packer trucks allows the department to operate with only two trucks, whereas three vehicles were formerly required.

7) Closing the incinerator and the use of paper bags has permitted reducing the sanitation department from 14 to 9 full time employees during the three collections per week schedule and from 11 to 6 during the remainder of the year.

8) Our new system of refuse collection and disposal will cost \$9,000 less this year than our previous methods would have cost. Future savings should amount to a minimum of \$6,000 annually.



● AT EACH pick-up, the filled paper bag is removed from the can and a new liner inserted. Three or more customers can be serviced before collector returns to truck.

Rubberized Sealants

PROTECT NEW CIVIC CENTER GARAGE

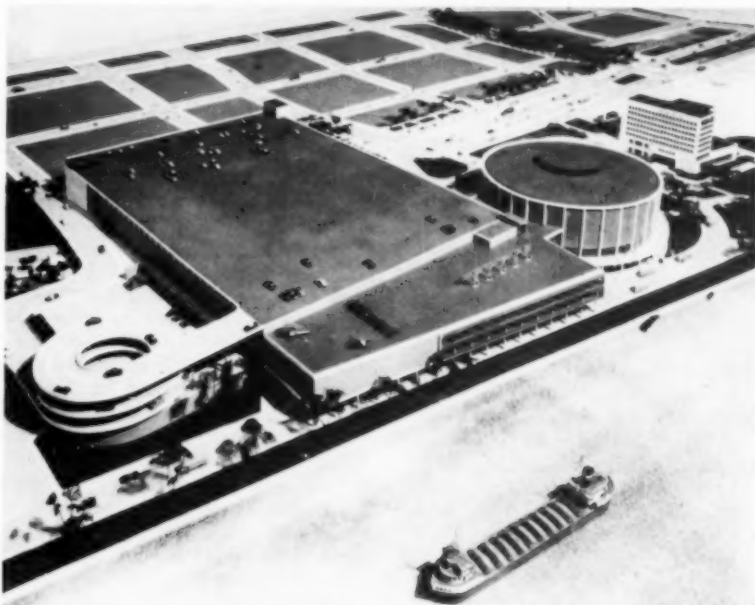
WHEN designing multideck garages and the huge spiral ramps such as in Detroit's new multimillion dollar civic center, engineers are plagued with the problem of protecting the structures from the destructive action of salt water and oil dripping from automobiles. This drizzle could, through the years, seep into the floors and walls of a building until the structure is dangerously weakened.

Designers of the Cobo Hall-Convention Arena in the modern civic center on the bank of the Detroit River solved the problem by specifying that the floors and ramps used for automobile traffic be coated with a special protective sealant. The sealant chosen was Rub-R-Road compound R-526, developed by the Xylos division of The Firestone Tire & Rubber Company. It is simply poured onto the surface and then spread with a squeegee.

Rubberized asphaltic concrete one-inch thick was then laid atop the seal coat to provide a wearing surface which will last for many years. This hot mix was rubberized by the addition of Firestone latex R-504 added in the proportion of approximately one and one-half gallons per ton of asphaltic concrete. The rubberized mix was chosen for the wearing course because of its flexibility. An exceptionally flexible material was needed because normal paving materials might crack under the natural flexing action of the floors when heavy traffic is moving over them. The cracking action might easily create leaks, permitting salt water and oil drippage to seep into the concrete.

This method of treatment was used on the spiral ramp leading to the rooftop parking area of Cobo Hall, the 606-car garage beneath the exhibits building and the 418-car convention hall garage. Approximately 44,000 square yards of pavement will have been treated by the time the giant civic center is completed in 1961.

Architect and engineer is Giffels & Rossetti; Detroit Concrete Products, Inc. was the prime contractor for paving and sealing; sealing operation was subcontracted to Pams Products, Inc. All are Detroit firms.



● LARGEST unit in Detroit's new civic center will look like this when completed. Spiral ramp leads to rooftop parking space for 1,150 cars and to a helicopter deck.



● WORKMEN apply rubberized sealant to floor of underground parking garage at the civic center. A gallon and a half of latex is added per ton of asphaltic concrete.

DE-SLICKING

ASPHALT SURFACES

MERL J. FORD

Field Engineer of Maintenance
State Highway Department of Indiana

HIGHWAY engineers have long studied the problem of preventing accidents. Even our latest super-highways with limited access and 50 ft. divider strips have yielded their fair share of the accidents and fatalities. While much money and effort have been expended in design and construction of safer new highways, there is still a need for improvement of the existing highways that we do not have money enough to rebuild. This paper deals with this phase of work on bituminous surfaces.

A study of our bituminous surfaces in Indiana showed numerous places where improvements could be made. Investigation indicated two basic causes for unsafe surfaces due to slickness: 1) Asphalt flushing to the surface, and 2) polishing of exposed aggregate.

The most practical way to remove surface asphalt seems to be to blade it off after it has been heated. In our opinion, this type of operation should be used far more extensively than it is at the present time. There is a secondary benefit to the road that occurs during this operation—wheel ruts, bumps and other surface irregularities are removed.

We start the blading operation by opening a trench in the shoulder adjacent to the pavement. This provides a disposal area for the material we are going to remove. Next, our heater is dragged along the hump between the wheel tracks. A motor grader follows closely removing as much of this hump as possible. If the hump is more than $\frac{1}{2}$ -in. high, an additional pass is necessary in order to cut deep enough to remove the flushed asphalt from the wheel track area. The outside edge of the pavement is then heated and bladed. Since we have worked only on the worst roads, we have found it necessary in most cases to make ten (10)

passes to completely reshape and de-slick a 24' road surface.

Our heater is 18-ft. long, 63-in. wide and burns approximately 30 gal. of fuel oil per hour. It will heat the road satisfactorily in warm weather if pulled at the rate of 20-ft. per minute. We have found that this rate is not adequate, and the next unit we build will be 7 $\frac{1}{2}$ -ft. wide and have enough heating capacity to progress at a minimum rate of 50 ft. per minute when the temperature of the road surface is 50°F. A heavy-duty motor grader is required to cut the road surface. The cutting should be done as closely behind the heater as possible. Since this operation is performed under traffic, it is necessary to have another blade or broom follow to clean the pavement.

The first road worked on was US 6, between SR 313 and SR 13-A. This hot asphaltic concrete surface was placed over a bituminous-coated aggregate blend that had been mixed with MC asphalt. In addition to the flushing of the MC asphalt up through the hot asphaltic concrete, there was evidence of serious wheel rutting. Skid tests performed at 34.4 mph showed the stopping distance to be as high as 185 ft. before de-slicking. After de-slicking, the poorest area provided a stopping distance of 111 ft. with the average for the whole section being around 85 ft. We were not satisfied with these results and could have improved them but were prevented from further operation by winter weather. However, we did improve the riding condition of the road and cut the stopping distance approximately in half. Traffic accidents fell off sharply after this operation. This was one of our worst roads and required an unusual amount of cutting. An accurate cost record showed that the work averaged 17 cents per square yard. Other cutting operations on cold-mix surfaces have run as low as 10 cents per square yard. We estimate that the cost of this same operation, using a heater which would progress at the rate of 50 ft. per minute, would be re-

duced approximately 50 percent. We intend to build a heater that will accomplish this.

Many miles of bituminous surface offer poor skid resistance due to the fact that the aggregate has become polished. If, in addition to having polished aggregate, the surface is distorted by wheel-rutting and shoving, the heater and blade procedure described above is the solution to this multiple problem. I do not mean that the same problems will not recur. In due time, the aggregate will again become polished; the wheel rutting and the shoving will reappear. A good point to keep in mind is that the wheel rutting and shoving would probably reappear even if a new surface was put on top of this faulty material.

In the case where the aggregate in the surface is polished but there is no wheel rutting or shoving present, the heater and blade could be used, but a more permanent solution is the application of a thin abrasive surface. The Highway Department in previous years used Kentucky Rock Asphalt with excellent results. It proved to be durable and afforded the best skid resistance of any material that was readily available. When the source of this material became depleted, the Department developed a manufactured product which had similar characteristics. In 1953, a test section was placed on US 421 south of Osgood. The material consisted of a mixture of AP-5 asphalt and silica sand. This section has proved to us that a satisfactory material can be manufactured.

Due to the problem of availability of silica sand, we readily accepted the suggestion of the Purdue Joint Highway Research that we also try a mix made from No. 17 sand. The results of work that had been done by the Purdue Joint Highway Research, the State Highway Testing Department and engineers of the asphalt industry were combined to give us the formula for the mix that was laid on SR 67, one-half mile south of SR 43. The road surface to be covered was hot asphaltic con-

crete that had become slick due to polishing of the aggregate. This stretch of road was selected as a test area because it was a typical example of our slick hot asphaltic concrete surface. Further, it traversed several steep grades and dangerous curves which had produced many serious accidents. It was felt that the heavy truck concentration on this road would give us an answer to the durability of the material. The construction of the surface was completed in October of 1958. Recent inspections have shown that almost two years of use and two winters of weather have not materially changed the surface. There have been no reported accidents due to skidding since this surface was

treated. The public has been very flattering in giving us its unprofessional opinions on this improvement.

Two other areas were covered in 1959. An area on US 52, one-half mile north of SR 100 shows some scaling in spots where the material was placed too thin. Other than that, the material seems to have behaved very similar to that on SR 67.

Apparently we had developed a satisfactory material, but we were not sure that it could not be improved by varying the percent of bitumen and the penetration of asphalt. Consequently, we decided to place 200-ft. test sections on both traffic lanes on US52, near SR28. Convenience of location for every-

one interested, was the main consideration rather than any record of slippery properties of the AH Type B surface in use there since 1950. There were 24 test sections laid. No. 1 to No. 5 sections had No. 17 sand and AE-60 progressing 6.5, 7.0, 7.5, 8.0 and 8.5 percent bitumen with no filler. No. 6 to No. 10 sections repeated the above except that five percent mineral filler was included. Sections No. 11 to 15 repeated Section No. 1 to 5 except for use of AE-90 instead of AE-60. Sections No. 16 to 20 repeated Sections No. 11 to 15 except for 5 percent added mineral filler. Section No. 21 had 8.5 percent bitumen from AE-90 with 10 percent added filler; Section No. 22, 7.5 percent bitumen from AE-150; Section No. 23, 7.5 percent bitumen from AE-200; and Section 24 was planned for 7.5 percent bitumen from AE-200 with 5 percent mineral filler. Extraction tests confirmed all mixtures except No. 24. It showed about 8.4 percent instead of 7.5 percent bitumen and was removed as it soon became unsafe.

Visual inspections and the results of skid tests lead us to believe that the field test section put down on SR 67 is as good as and better than most of the other test sections constructed. The sand used on this section was No. 17 scalped over a No. 8 sieve and containing approximately 7.1 percent bitumen. The complete specifications for this material are available at the Indiana State Highway Department.

Another interesting piece of deslicking was performed by the Madison Sub-District under the supervision of the Seymour District office. This was a seal job on SR 256 immediately East of SR 3. The road surface was primed with 0.17 gal. of AE-90 and covered with approximately 12 lbs. of boiler slag. The results were beyond the expectations of anyone involved. Boiler slag seems to have a definite affinity for asphalt and even this small amount of prime was sufficient to stick practically every particle. The resultant road surface is very skid resistant and pleasing in appearance. Because of the fineness of the particles and the strength of the bond between the asphalt and the boiler slag, it is possible that this could be used to de-slick some of our hot asphaltic concrete surfaces. To date, we have found no other combination of materials that could stay on a heavily traveled hot mix surface. We intend to do further experimenting with the use of boiler slag for deslicking.

Indiana's Specification on Sand-Asphalt Surface Courses

D404.2(a4). Type IV Surface Course (Sand-Mix).

This surface course shall comply with applicable provisions of the job-mix formula and as further set out herein and shall be known as Type IV. It is designed as a skid-resistant wearing surface. The aggregate shall be natural sand complying with J5 and the following detailed gradations:

Total Percentages Passing Sieves With Square Openings

Sieve Size	No. 4	No. 6	No. 8	No. 16	No. 50	No. 100	No. 200
Percent passing	100	95-100	90-100	55-85	6-50	1-15	0-5

This sand shall consist of not less than 60 percent sharp silica particles. When two or more sands are combined to produce a material of any given size they shall be weighed into the mixer separately, or shall be thoroughly mixed before introduction into the mixing plant.

The asphalt used shall be Emulsified Asphalt AE-60, AE-90 or AE-200, as specified. The bitumen content, exclusive of water or solvent, shall be from 6.5 to 8.5 percent, by weight. The bitumen content, determined by extraction, shall be as fixed by the Engineer within these limits.

The mixtures shall be uniformly coated, shall have satisfactory workability, and shall be produced at a temperature of 200 to 300°F.

The sand-mix shall be laid in an amount of 40 to 50 pounds per square yard.

The pavement to be surfaced shall be given a tack coat of 0.10 to 0.20 gallon per square yard of Emulsified Asphalt AE-60 or AE-90 or AE-200, diluted with water at the plant to 50 percent asphalt content.

At the discretion of the Engineer, the sand-mix shall meet the following test requirements:

1. When 50 g. of mixture is heated at 250°F. in a laboratory oven for 1 hour and cooled to 200°F. in laboratory air, and then is placed in 400 ml. of boiling distilled water in a 600-ml. glass beaker and stirred with a glass rod at the rate of 1 revolution per second for 3 minutes, the aggregate shall be at least 75 percent coated with a bituminous film.

2. A specimen of the mixture formed at 140°F. by means of the kneading method specified in ASTM, D 1561-58T shall have a stability value of not less than 16 when tested at a temperature of 140°F. ($\pm 5^\circ\text{F.}$) by the method specified in ASTM, D1560-58T. The volume of voids in this specimen shall be between 7 and 12 percent.

EMERGENCY



PUBLIC WORKS

SERVICES IN CIVIL DEFENSE

BARENT F. LANDSTREET

Deputy Assistant Director for Emergency
Community Services
Office of Civil and Defense Mobilization
Battle Creek, Michigan

PUBLIC WORKS departments are important arms of local governments. Their functions are vital to the communities they serve. Residents of urban centers tend to take for granted the smooth functioning of public works services and have little knowledge of the complex nature of the operations which make possible a modern city's existence.

The complexities of peacetime operations, however, will be infinitely compounded under disaster conditions. The ability of emergency public works services to function at such times will depend upon the degree to which civil defense planning has been implemented into government machinery at operating levels.

Civil defense, by definition, is nonmilitary preparedness for emergencies. It stresses preparedness for nuclear attack by the enemy and emphasizes pre-attack planning for post-attack operations. The existence of an emergency plan, however, does not necessarily insure full civil preparedness. The plan also must be a part of the community structure and geared to prevent, minimize, or repair the consequences of the emergency.

The need for civil defense is questioned less frequently today. Complacency is being replaced by an awareness of the threat and realization of the devastating consequences of nuclear warfare. We must learn to live with the threat, at the same time striving continually for peace. We must also maintain a constant state of preparedness. Civil and military leaders alike recognize total preparedness as a great deterrent to action by an aggressor.

The National Plan for Civil De-

fense Mobilization blueprints the civil defense responsibilities of all persons, from individual citizens to officials at all levels of government. It outlines in broad terms the procedures to follow in establishing emergency operating plans. Annexes to the Plan provide details for major areas of concern. Many of them are of major interest to public works engineers and officials.

This article relates some of the responsibilities and problems public works personnel would face in the period following a nuclear attack. In an emergency of this nature, their task literally would be to "pick up the pieces." They would repair, restore, and rebuild. Their responsibilities would include: 1) Damage surveys and analyses; 2) debris clearance of streets, highways, railways, airports, waterways, and docks; 3) temporary restoration of essential community facilities and utilities such as hospitals, roads, water, electric, gas, and sewage sys-



Photos courtesy Office of Civil Defense Mobilization

● "TEN-MILE" engineering stockpile in FCDA warehouse. Pipe and other units facilitate repair, restoration and rebuilding.

tems; 4) construction of temporary buildings for first aid, mass care, and rehabilitations; 5) directed movement of the population and engineering resources; 6) decontamination of resources; 7) mass burial of the dead; and 8) shoring and demolition of structures.

Most of these activities are not strange to public works people. Many of them have experience in floods, fires, explosions, tornadoes, and similar disasters. Some of the effects of a massive nuclear attack would be similar to those experienced in natural disasters. The area of disaster would be on a national scale, however, and would be of such magnitude as to preclude any hope for immediate, significant help from the Federal Government. Cities, counties, and States might have to be self-sufficient for an extended period. Moreover, new and unfamiliar elements, such as radioactive fallout and chemical and biological warfare agents would require special countermeasures. Public works personnel, other emergency workers, and the remaining population would have to be protected from the harmful effects of exposure to these elements.

Major areas of concern to public works engineers and officials include water supply, sewerage facilities, waste disposal, debris clearance, and road repair. Special consideration is given to some of the specific problems within these areas.

Water Supply

Water is one of the necessities of life. It is impossible to live long without it. Planning for an emergency supply obviously is a necessity. In anticipating the problems of providing water in an emergency, one must consider the nature of the damage likely to result in the event of an attack. Detonation of a nuclear weapon would create a large area of devastation, with damage becoming progressively less as distance from "ground zero" increased. This point of detonation would have much to do with the amount of water available for post-attack use. For this reason, several locations should be selected when studying potential damage effects to a community's water system.

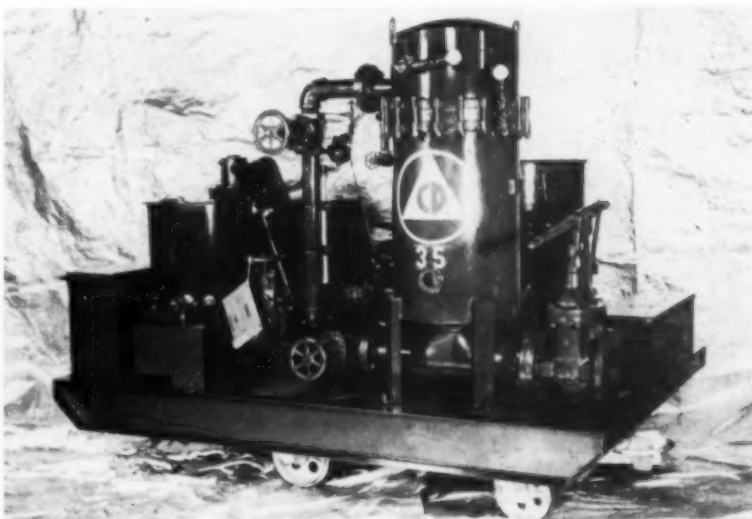
Fallout is another problem. Water utilities personnel who man essential facilities and decontaminate water supplies must not be exposed to radiation beyond safe limits. This, of course, applies to personnel of all areas under consideration. Personnel charged with decontaminating water must be able to detect the

presence of radioactivity, analyze its intensity, determine its nature qualitatively, and reduce contamination to tolerable levels. If the water cannot be decontaminated, people must be advised not to drink it until the radioactivity has decayed to safe limits.

If a source of water or a transmission main to a service area is destroyed, a considerable area may be without water for a long time. Valve operating crews will be in demand

be similar to one for water supply. The importance of an emergency plan which details procedures for keeping sewage works in operation cannot be overstated.

Where water and sewage services have been disrupted, special consideration must be given to problems of human waste disposal at hospitals, first aid stations, and mass care centers. Close liaison between community health and sewage division officials will be valuable in de-



● WATER purification unit of the diatomite filter type is equipped with gasoline engine drive for use in emergencies. Capacity under normal conditions is 100 GPM.

for isolating undamaged portions of a water system. The preserving and servicing of facilities that are intact should be emphasized. Maintenance programs should be carried on continuously to assure elimination of weak elements.

Engineering equipment and supplies are stocked by OCDM in 24 locations throughout the country to provide emergency water supply resources to communities within these areas. State and local governments can obtain Federal matching funds for purchasing similar materials for their own stockpile use. The OCDM equipment may be loaned to State, county, and municipal civil defense agencies for training purposes and 50% of the cost of the training courses may be approved for Federal matching funds. The use of equipment, except water distillation units, is covered by appropriate OCDM technical bulletins.

Sewerage Facilities and Waste Disposal

An analysis of the sewage and waste disposal problems anticipated under emergency conditions should

ciding the best improvised means for disposing of human wastes. Excavated disposal bags might be used; latrines might be dug; scavenging teams might be required; and, in extreme emergencies, chemical toilets might be used for emergency housing units, hospitals, or other structures.

If there is no disruption of water service, efforts to keep sewage flowing should take priority over less immediate needs. Every attempt must be made to avoid sewer back-ups into basement shelters. Here again there may be a need for standby power and provision should be made for it.

Debris Removal

Clearing debris from essential roads, streets, highways and airports in stricken areas will be a major task for public works services. Radiation would probably cause long-term denial of access to many areas fringing the blast zone. An OCDM manual provides detailed information of the effects of atomic weapons on streets and highways as well as guidance on
(Continued on page 218)

RESERVOIR CLEARING OPERATIONS YIELD A PROFIT



● BULL RUN River above Bull Run Dam No. 2. Clearing has been practically completed. Scrap or unsalable timber has been piled for burning. Cleared area was about 500 acres.

H. KENNETH ANDERSON

Chief Engineer,
Bureau of Water Works,
Portland, Oregon

CLEARING of reservoir sites in virgin Douglas fir country is getting to be more or less routine for Bureau of Water Works personnel in Portland, Oregon. Beginning in 1916 and continuing to the present, such work has been intermittently carried on as necessary to provide more storage by the construction of dams.

The rapid growth of the city and its surrounding metropolitan area has made it necessary to augment the summer flow of the source of supply, Bull Run River, by building storage reservoirs within the watershed. Storage of 3,000 million gallons in Bull Run Lake, the source of Bull Run River, was sufficient to augment low water periods until 1926, when the 5-sq. mile catchment area no longer provided the water required, leaving the supply critically low.

Bull Run Dam No. 1, with a catchment area of 100 square miles and 16 miles downstream from the lake, was built in 1929. Here, 10,000 million gallons are stored and this was sufficient until the summer peak demand made it advisable to build

Bull Run Dam No. 2 and increase the storage by another 6,000 million gallons. With the completion of this dam, probably during 1960, there will be a storage above the headworks of 19,000 million gallons.

Accepted practice in clearing the inundated areas, is to remove all vegetation, including ground coverage in the form of accumulated humus, right down to the soil, leaving only the solid stumps which do not rot under water. Small sticks and limbs are left on the ground to

reduce erosion; when the reservoir fills these will float to the surface and will be removed. Further to reduce erosion during the interim period between clearing and filling, some grassing is provided.

The flow line was established by a crew of four men—levelman, rodman and two axemen. Most of the work was done in the winter or early spring when vegetation offered the least problem.

In 1929, 434 acres were cleared above Dam No. 1 by contract, under



● WATER behind Bull Run Dam No. 1 has been drawn down. Reservoir was built in 1929; clearing cost \$190,000; timber sales from Dam No. 2 were \$1,600,000.

the terms of which logs and brush alike were drawn into piles and burned, since the transportation cost was greater than the value of the timber at shipment destination. The clearing represented a direct cost of \$190,000.

In direct contrast, the vegetation has been cleared from the 500 acres above Dam No. 2 during the last three years by contractors who were successful bidders for the merchantable trees. Bids for Douglas fir ranged from \$35.05 to \$52.25 per thousand board feet; the Bureau of Water received approximately \$1,600,000 from the timber on the area cleared. Logs were hauled by trucks from the cutting area to the mill. Specifications, covering the logging operations, were rigidly exacting, and supported by sizeable surety bonds and heavy penalties for any failures of commission or omission. The intent was to insure continued cleanliness and purity of the water at all times and to offer additional protection of vegetation coverage adjacent to the land being cleared. These stringent requirements resulted in a cost to the contractor which was reflected in his bidding.

Contractors' Obligations

Contractors were obligated:

1. To furnish a logging plan for the sale area prior to initiating felling, the plan to conform with Oregon Forest Conservation and Protection laws, and to be approved by the city. After approval, changes could be made only with the mutual consent of the contractor and the city. Restrictions were placed on logging equipment as necessary to protect the water supply and watershed.

2. To locate all truck and tractor roads and landings with approval and "cleared as designated" by the city.

3. To prosecute, as far as practicable, all branches of logging so that they would keep pace with one another—i.e., slash disposal should not fall materially behind cutting.

4. To conduct logging operations so as to minimize damage to stream courses; to remove all logging debris of every description from any stream course; and not to haul or yard logs across any stream without consent of the city.

5. To take precautions in constructing truck and skid roads, and in other phases of logging, to minimize damage to the soil and to prevent the creation of conditions conducive to soil erosion; and to repair any damage suffered.



● TYPICAL logging scene during clearing of area behind Dam No. 2. The work was governed by rigid specifications aimed at preventing fires and/or danger to health.

6. To construct drainage dips and water spreading ditches on skid trails and roads to be abandoned; to flash burn all slash without piling, and to leave all small sticks and limbs on the ground to hinder erosion; to pile longitudinally for burning, using dozers with clearing blades, all unmerchantable logs, etc.; and to cut to mineral soil a fire line, a bulldozer blade in width around the entire sale area before felling trees.

7. To endeavor to prevent and suppress forest fires, and to require all employees under his control to do likewise by keeping men and equipment available to any authorized forest officers for the purpose of fighting fires, such fighting to be without remuneration on the sale area.

8. To prohibit smoking and the building of camp or lunch fires except at established places, designated by the city.

9. To keep certain tail tree equipment—tank truck with equipment, tool boxes, and barrels of water available as directed by the City; to provide each internal combustion motor and/or yarder with chemical fire extinguishers and each truck and tractor with a chemical fire extinguisher, a round-pointed shovel, and a double-bitted axe, with each extinguisher tested or checked each year, and fire equipment so mounted as to be readily reached from the ground.

10. To keep each gasoline power saw equipped with one chemical pressurized fire extinguisher and a round pointed shovel, with any fueling or refueling of the power saw to be done in an area which has been cleaned of material able to carry fire.

Blasting: The use of fuses in blasting was not permitted. Whenever the relative humidity fell below 50 at a point where blasting was done, a watchman remained on duty for at least one hour after blasting was finished. During periods of fire danger, a filled backpack can with pump or other immediate

source of water had to be available at any place where blasting was being done. During periods when the relative humidity fell below 40, blasting was discontinued entirely; and it might be discontinued at any time during exceptional fire emergency conditions as determined by the City. Blasting was not permitted in any cutting area where timber had been felled and slash not burned, unless special precautions were taken. Blasting was not permitted for topping trees in the sale area.

The contractor was required to provide and maintain weather instruments to measure the relative humidity and temperature of the air and the direction of the wind.

During periods of exceptional emergency created by hazardous climatic conditions or otherwise, additional patrols or other emergency measures were required. If the City deemed such additional provisions not adequate, or if the contractor did not fully comply with the required emergency measures the City could close down logging operations.

Temporary living or camping at the site was not permitted. All workers were required to leave immediately the Bull Run Reserve at the completion of each day's work. The contractor was required to observe the rules of the State Board of Health and furnish a water-proofed plywood rigidly reinforced movable privy. The fixtures included a toilet seat and cover and a separate urinal connected to an enclosed and securely fastened 45 gallon tank vented through the roof.

The contractor had to remove and dispose of the refuse from the site at least once a week. Particular care was given to prevent conditions which could lead to the breeding of flies, mosquitoes or other disease carrying insects or vermin. Any workman suffering from a contagious or infectious disease, or anyone developing any such contagious or infectious disease while employed upon the work, had to be removed from the work immediately.



● WATER flowed freely after old material was removed from this joint. Openings along floor of tunnel were sealed first.



● QUICK setting mortar being placed by hand in a joint at side of the tunnel. Only a small quantity is mixed at a time.

TUNNEL SEALED AGAINST TIDE WATER

HIGH TIDES in the Passaic River were causing floods in a utility tunnel under a new river edge expressway section of New Jersey Route 21, until the problem was recently solved by the use of quick-setting mortars to stem the flow of ground water through joints in the liner pipe.

The 5 ft. by 7 ft. arched tunnel was constructed as a part of the State Highway Department's roadway contract to accommodate existing waste water lines from an industrial plant to the river's edge. The tunnel, with hangers to carry pipe lines, was constructed of twenty reinforced-concrete arched-pipe sections. With mortared joints between sections, the pipe has an invert elevation 4½ ft. below the high tide level of the river. At the river bank the tunnel terminated in a junction chamber with the pipes outletted through the chamber wall.

After completion and opening to traffic of the highway, it was discovered that differential settlement of the pipe trench or imperfect sealing of the pipe joints was permitting the infiltration of an excessive volume of ground water. This flow became quite severe during periods of

high tide. Moreover, since the water flowed in through the joints more readily than it flowed out, the tunnel was constantly flooded.

Alternate solutions to the problem which were considered, included an attempt to seal the exterior of the pipe by extruding a grout into the area around the perimeter of the joints, dewatering the pipe trench area through a well-point and sump pump installation, or resealing the inside face of the pipe joints. The last mentioned procedure, which was selected, was made more difficult by the fact that it had to be accomplished while water, under pressure, was flowing through the joints.

To do the job, the Sika Chemical Company, Passaic, New Jersey, sent a crew of specialists from its contracting division. The pipe tunnel was emptied by pumps and the old joints cleaned of all mortar as far as possible around the mortise and tenon section. The bottom of the opened joint section was then effectively sealed with a thin application of quick setting mortar compounded of sand, portland cement and Sika No. 42 Quickset, which causes the mortar to set in 45 sec-

onds. The mortar was wiped into the joint by hand by workmen wearing rubber gloves. Sealing progressed from the sides toward the center of the pipe invert at each joint where it was completed by a final plug of mortar containing Sika No. 2, which sets in 15 seconds. Progress within the pipe proceeded joint by joint, from the high toward the low end of the pipe.

With the completion of the cleaning and mortar sealing of the joints, each joint was then filled to within one inch of the surface with Sika's Igas joint sealer and capped with a standard mortar cover wiped flush with the pipe surface. The Igas offers a flexible seal to prevent leakage in the event of further minor movement of the pipe while the mortar cover retains and protects the sealant and offers a firm, clean interior pipe surface.

The accomplishment of this project without the use of costly well-point installations or problematical grouting procedures proved both economical and expeditious. The engineers are confident that the work will successfully protect the tunnel from further invasion by ground water.

Lime Recovery at a Water Treatment Plant

THE DAYTON, Ohio, Water Department two years ago invested a million dollars to expand facilities of its water treatment plant. Objective of this expansion was to cut bulk chemical cost by reactivating lime taken from sludge and reusing it in the treatment process.

The investment resulted in construction of a sizable recalcining plant that was integrated with the existing treatment plant. Its principal components consisted of a lime kiln, process buildings and a Dracco airstream conveyor. The new plant recovers up to 20 percent more lime than originally added, with additional capacity to process most of the lime sludge accumulated over the last five years. In fact the plant has shifted from its role of a strict consumer to that of a manufacturer, meeting its own processing demands and selling the surplus. The result is a cost-saving operation whereby new lime need is reduced and an actual profit is made from the excess that is produced.

In the reclaiming process, lime from sludge is recalcinated in the kiln and moved to the nearby main storage bin which is 70 feet high and 30 feet in diameter. At the bottom of the main bin is the beginning of the air conveyor system. Here the system takes over the job of moving the lime through an 8-inch conveyor line to the water treatment building 383 feet away. Part way along the conveyor line a switching station allows diversion of material to excess storage, a sales bin where the lime is stored for outside consumption. Material destined for plant use is discharged to a receiver atop the treatment building for treatment utilization.

Running alongside the conveyor line is a dust line. It returns lime dust from both the treatment building receiver and sales bin to main storage. A 3-compartment Multi-Bag filter, built integrally atop the storage bin, collects the dust and discharges it into the bin. Thus the cycle for retrieving valuable lime has been completed.

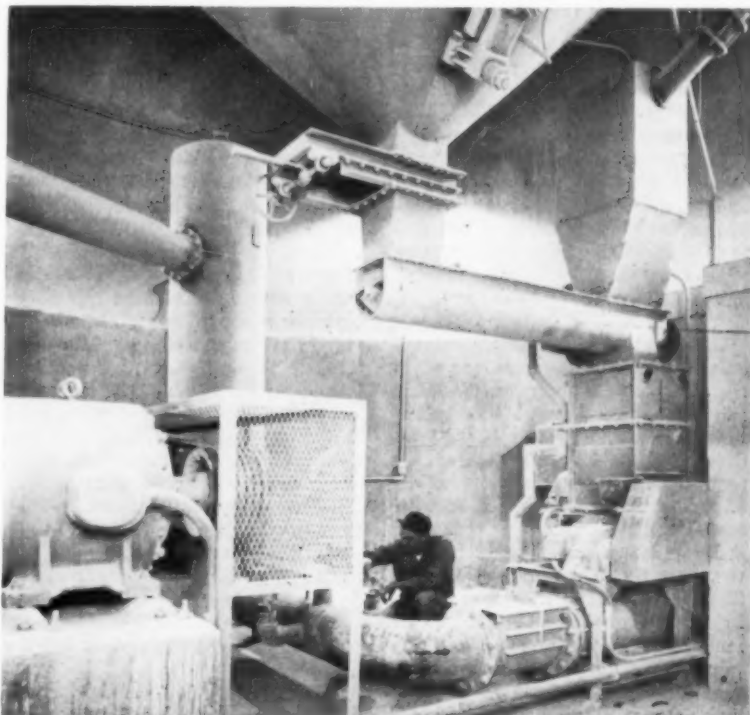
The conveyor actually gives the recalcining plant a two-prong advantage. It provides a second way

for reclaiming a useful treatment chemical. But more important, it moves great volumes of bulk material quickly and efficiently, with a minimum of operating personnel.

Further, it effectively keeps dust under control and out of the air, resulting in a cleaner plant, less waste and good employee health conditions.



● RECALCINING plant at Dayton, with 70-ft. high main storage bin in foreground and kiln and process building behind it. Water treatment building is at left rear.



● BASEMENT under storage bin. Note vibrators on bin cone. Material flows through conveyor to lock, right. Blower, left, moves lime by suction-pressure.

The Qualigram ---

A VISUAL-AID DEVICE FOR RIVER DATA APPRAISAL

EDWARD J. CLEARY

Executive Director and Chief Engineer,
Ohio River Valley
Water Sanitation Commission,
Cincinnati, Ohio

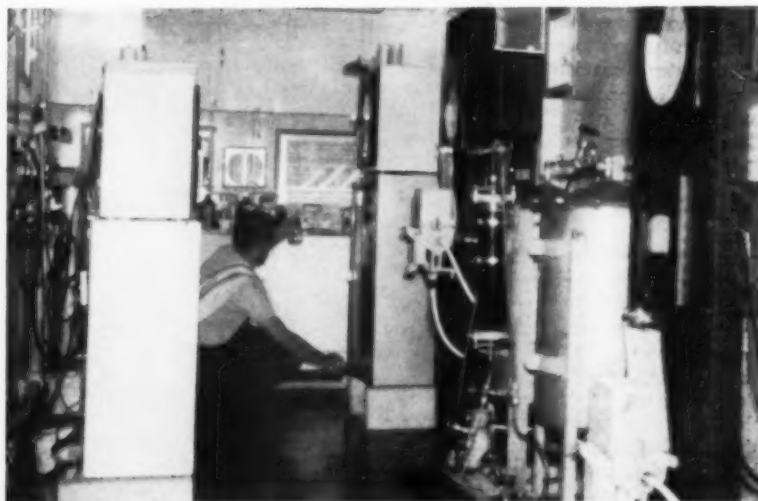
ITEMS of data are like a heap of bricks. Until they are arranged in some orderly fashion their usefulness is limited. Nowhere is this more obvious than in the endeavor to evaluate river-quality conditions from thousands of items of analytical data.

In searching for better ways to portray the findings from an interstate river monitoring program inaugurated eight years ago, the staff of the Ohio River Valley Water Sanitation Commission, has experimented with numerous tabulation and graphical devices. One of the latter, which has been given the name "Qualigram" appears to have special merit.

The Qualigram is an isometric representation that shows for different stretches of a river the observed range of a specific quality condition as well as the frequency of occurrence of the condition. Examples are shown in the accompanying illustrations. Those familiar with the flow-duration curve method of hydrographic-data analysis will recognize the kinship between this and the ORSANCO qualigraphic system of presentation.

How a Qualigram is Made

Construction of a Qualigram is based on percentage portrayal of the frequency of occurrence of a condition. For example, the alkalinity picture shown in Fig. 1 was developed as follows: All of the monthly-average alkalinity values of record at each river station were sorted and arranged in an ascending order of magnitude. Frequency values were then computed. These define the percent of time that the alkalinity is equal to or less than each magnitude in the array. From this tabulation a curve was plotted using alkalinity values for the Y axis and percent-of-time occurrence for the X axis. Summarized in this fashion are alkalinity records for



● ORSANCO monitor station where automatic analyzers are being tested and evaluated for the job of continually checking certain variations in river-water quality.

periods that vary from 39 to 74 months, and which represent at some stations as many as 2,200 daily values.

In similar fashion Qualigrams have been applied to other data assembled from monitor stations on the Ohio River. The quality parameters analyzed in this fashion include: Alkalinity, pH, total hardness, sulfate, chloride, dissolved solids, temperature and turbidity.

With the data portrayed in the form of Qualigrams a panorama of understanding unfolds. Here at a glance is shown comparative quality in various stretches of the river; and in each stretch is revealed the range of quality and its frequency of occurrence. Thus, with regard to alkalinity, we find in the upper river (at Weirton), that the range is from 8 to 25 ppm. Going downstream we find progressive increases. At Golconda, in the lower river stretch, the alkalinity is equal to or less than 51 ppm as a monthly average value for five percent of the time; and that for 50 percent of the time the alkalinity is equal to or less than 75 ppm.

With regard to total hardness the Qualigrams reveal no great difference from stretch-to-stretch of the river. But comparison with the sul-

fate Qualigrams shows that the type of hardness-producing constituents does change. And it will be noted that in progressing down-stream an increasing percentage of total hardness is composed of carbonate-type constituents while a decreasing percentage represents sulfate-type hardness.

These are but samples of the kind of information and appraisal that readily become apparent from the construction and application of the qualigraphic system of data portrayal. Not the least of the merits of this system is that a technician can be trained easily in its construction. This relieves an engineer from the drudgery normally associated with data analysis and frees his time for the more exacting tasks of professional evaluation.

Qualigrams of the Ohio River Valley Water Sanitation Commission are based on river-monitor data developed by the Water Users Committee of ORSANCO and by the U. S. Geological Survey under a cooperative contract arrangement. David A. Robertson, Jr., staff engineer-hydrologist, is in charge of the ORSANCO monitor program. Roy H. Reuter, engineer-in-training, assisted in constructing the Qualigrams.

ALKALINITY qualigrams

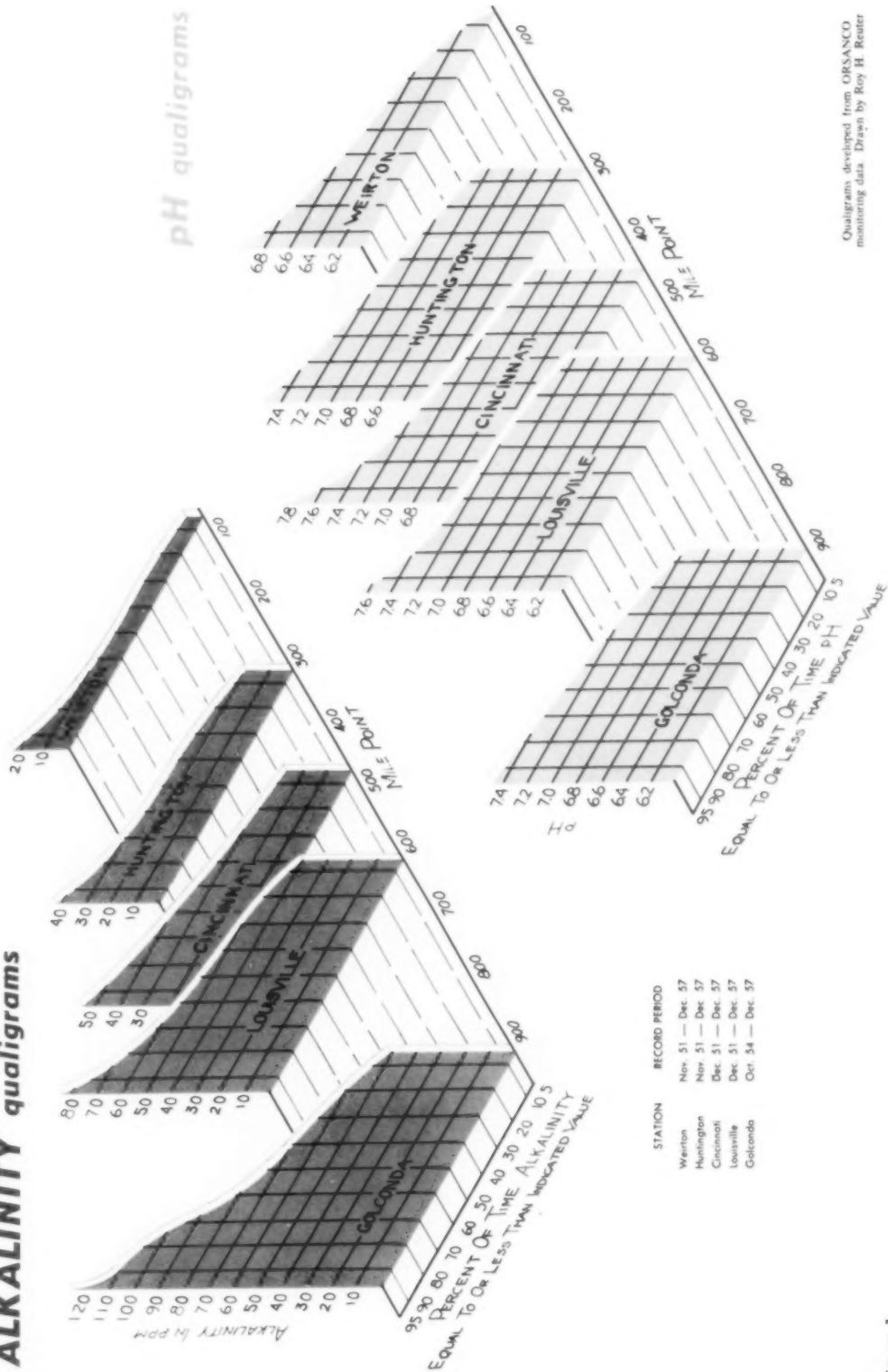
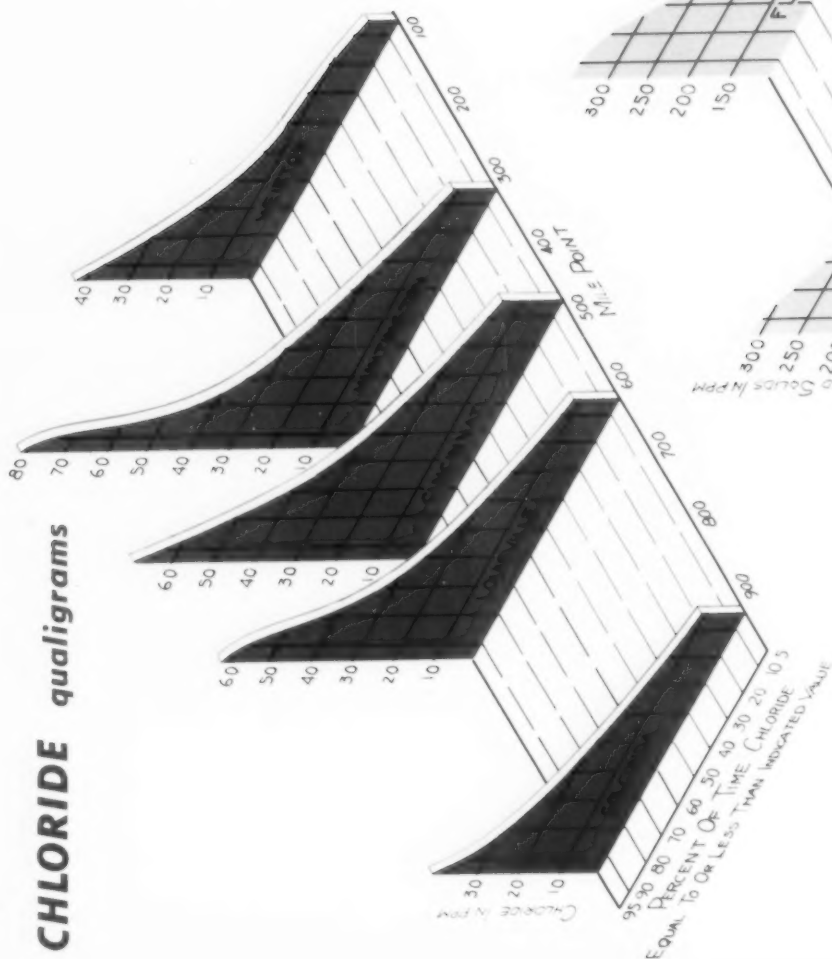


Figure 7

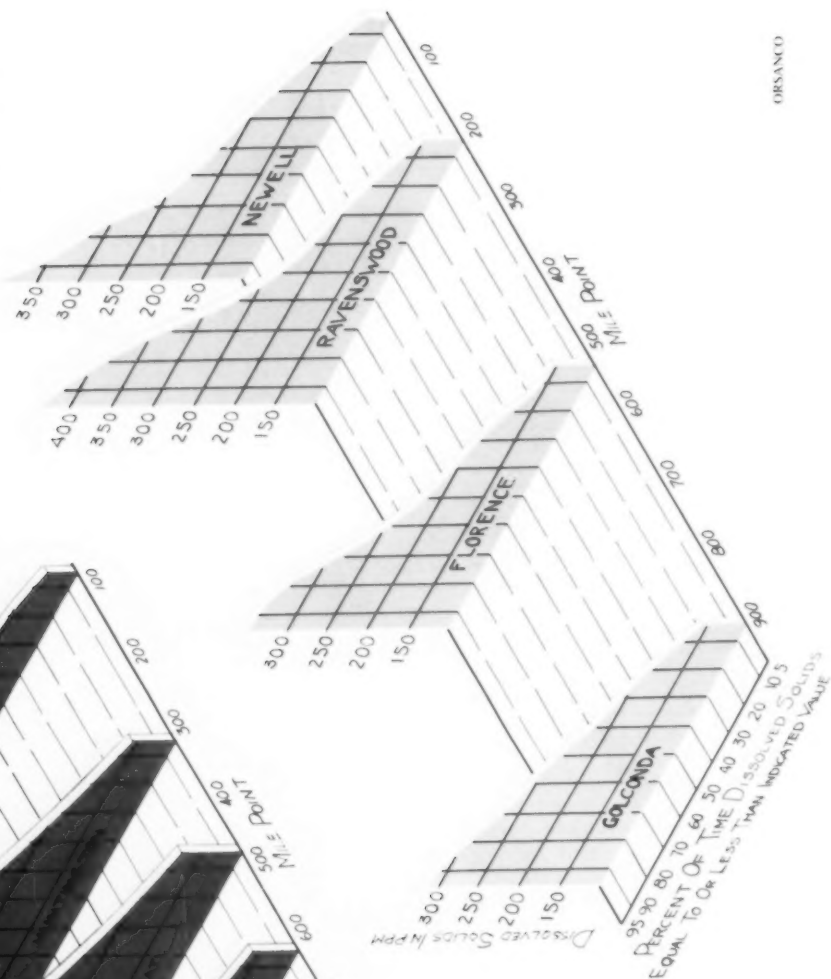
Qualigrams developed from ORSANCO monitoring data. Drawn by Roy H. Reuter

CHLORIDE qualigrams



STATION	RECORD PERIOD
Newell	Oct 54 — Dec 57
Wenton	Nov 51 — Dec 57
Brownwood	Oct 54 — Dec 57
Huntington	Jan 52 — Dec 57
Cincinnati	Dec 51 — Dec 57
Florence	Oct 54 — Dec 57
Louisville	Dec 51 — Dec 57
Galconda	Oct 54 — Dec 57

DISSOLVED SOLIDS qualigrams



ORSANCO

SEALING A SMALL DAM

GORDON E. THOMAS

Project Engineer,
Metcalf & Eddy,
Engineers,
Boston, Massachusetts

LEAKAGE through two abandoned 36-in. water wheel penstocks in the Borough Reservoir Dam at Groton, Connecticut, was approximating a million gallons a day. In addition to the water losses, Superintendent of the Department of Utilities, L. F. Dutton, was considerably concerned about an untimely failure of the wooden penstock gates; they were over 50 years old and under a constant pressure head of at least 7 ft. of water.

Constant water demand prevented draining or lowering the reservoir. This meant that repairs

would have to be carried out with the water level in the reservoir at about spillway crest.

To determine the extent of repairs required, a diver inspected the exterior condition of the penstock gates. The lumber in the gates was found to be in good condition, although the frame timbers were only fair. Inspection of the penstock interiors was made by cutting an entrance into each, at a point where both penstocks emerged through the concrete retaining wall that supports the earth embankment, about 20 ft. downstream from the penstock intakes. It was discovered that water was not leaking through the gates, as was first assumed, but was pouring into the penstocks through a 2-in. section of the rubble sidewall of the intake structure, between the end of the penstocks and the wood-

en gates. The depth of flowing water in each penstock was 2 to 3 in.

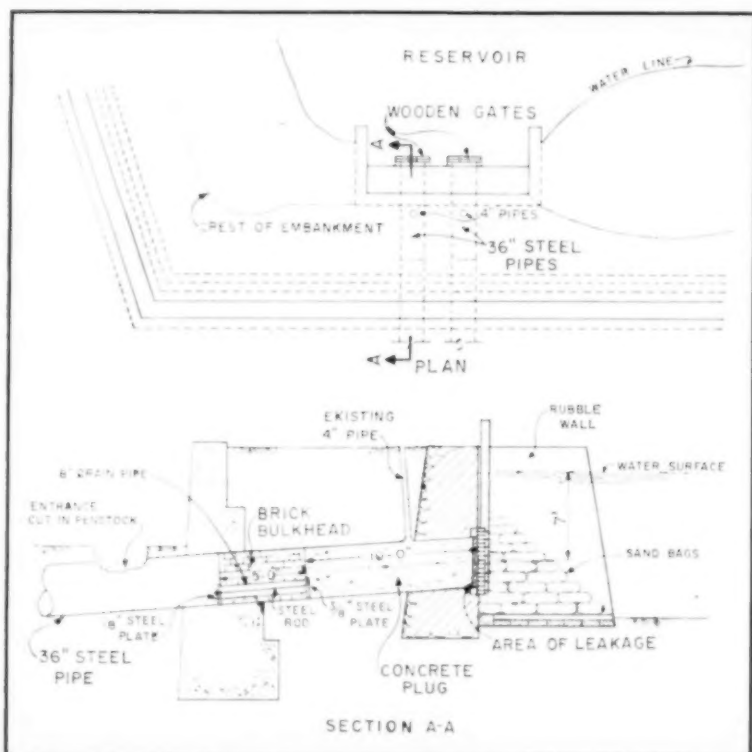
To provide an effective seal on the outside of the intake structure would require placement of a concrete wall across the gate openings on the upstream face of the rubble wall. This construction would require an earth cofferdam to do the work "in the dry", or placement of the concrete under water by the tremie method. In using the cofferdam, it was feared that there would be considerable seepage and sand boils within the work area. If the wall were to be poured under water by the tremie method, it was considered likely that there would be a sizable cement loss through the leaking areas; or, that the wooden gate frames would be overstressed.

Metcalf & Eddy, the Boston engineering firm retained for the project, decided that the most effective and economic seal would be accomplished by placing a concrete plug in each penstock directly behind the old gates.

The plan adopted by the contractor, Whaling City Dredge and Dock Corp. of Groton, was to construct a 5-ft. brick masonry bulkhead in each penstock approximately 10 ft. downstream from the gates. Having secured the wooden gates with sandbags against their upstream face, the resulting water-filled chambers would then be filled with concrete. Because of the existence of two 4-in. vertical pipes (one from each penstock), rising to the surface of the embankment immediately downstream of the intake structure, it was decided to place the concrete by the tremie method, utilizing these pipes.

Penstock Preparation

Preparation of the penstock interiors included removal of scale and provision for handling leakage during placement of the bulkhead. The latter was accomplished by installing a 5-ft. length of 8-in. pipe along the section of penstock where the brick bulkhead would be placed. The pipe was supported by $\frac{1}{8}$ -in. steel plate saddles at either



● DIAGRAM shows two penstocks which were leaking a million gallons per day and methods used for sealing them involving plugs of brick masonry and poured concrete.

end, cut to form 12-in. deep circular segments. The bottom edge of the upstream plate saddle was sealed with rubber, secured in place by means of an angle attached to the steel plate. This arrangement diverted the leakage through the pipe and beyond the work area. For subsequent sealing of the pipe, a rod was run through it, with a rubber gasket attached to the upstream end of the rod and the downstream end threaded. The entire pipe assembly was secured by a wooden wedge between the pipe and penstock roof.

The brick masonry bulkhead was then formed between the two steel

plates. After allowing the mortar to set about 5 days, the upstream end of the drain pipe was sealed by tightening a nut and plate on the threaded downstream end. Prior to placing concrete the following day, only slight seepage was evident on the face of each porous bulkhead, and this with the reservoir level above the spillway crest.

The concrete plug was placed in the water-filled chamber of the penstock by means of a 3-in. tremie pipe and hopper assembly inserted into the existing 4-in. vertical pipe connected to each penstock. Transit-mix concrete (1 part cement to 3 parts sand) was used, with Plas-

timent and Embeco added to increase fluidity and minimize shrinkage. Any trapped water was assumed to be displaced through the area of leakage. No escaping concrete was in evidence. Each chamber took its estimated volume (about $2\frac{1}{2}$ cu. yd.), with additional concrete left standing in the vertical 4-in. pipes for replacement of any seepage before the mass solidified.

Inspection of the downstream face of the brick bulkheads a month after the concrete plugs were completed, showed that an effective seal had been accomplished. Total cost—\$3,155.50.

PROGRESS...

PROMOTES STREET AND HIGHWAY PROGRAM

THE CITY of Fort Worth and its satellite cities in Tarrant County, Texas, have experienced phenomenal growth during the post war years, both in area and population. Fort Worth's population was 278,778 in 1950; the present population is estimated at 405,000, and it is expected to reach 800,000 by 1970. The City has grown in area from approximately 67 square miles in 1940 to approximately 155 square miles in 1960. In 1945, there were 84,084 motor vehicles registered in the County, as compared to approximately 277,553 registrations as of January 1, 1960.

The history of growth in population, area and motor vehicle registrations, and the potential growth in the same areas have made it necessary to plan and prepare a street-highway improvement program. The Fort Worth Chamber of Commerce, working with City, County, and Texas Highway Department officials, has proposed a Five-Year Street and Highway Program. Incorporated in this program are several major street widening and extension projects in the City of Fort Worth which are to be financed from funds provided in bond programs approved by city voters in 1951 and 1958. Also included are several highway-freeway projects under construction or in the planning stage by the Texas Highway Department.

A Street Improvement Bond Program was approved in 1958 which will provide, among other improve-

ments, \$10,700,000 for ten major thoroughfare projects in the City. These thoroughfares will include new constructions to connect various areas of the City and widening of existing streets to provide for heavier traffic due to subsequent development farther out from the downtown area. In addition to the above amount, which is the estimated cost to the City, an additional estimated \$1,000,000 will be assessed against the abutting property which specially benefits from the improvements. The 1958 Bond Program was prepared by a Bond Screening Committee which was appointed by the City Council. Estimates of cost, maps, sketches, and recommendations were submitted to this Committee by the City's Public Works Department through the City Manager. A Street Improvement Bond Program totaling \$22,875,000, for street construction, resurfacing, and reconstruction, storm drainage, street lights, and traffic signals, was approved on November 18, 1958. The first bond sale was in the amount of \$3,000,000 in the Spring of 1959, which allowed the preparation of plans and purchase of right-of-way to begin. It is proposed that \$3,800,000 in Street Improvement Bonds will be sold during 1960 to continue the program.

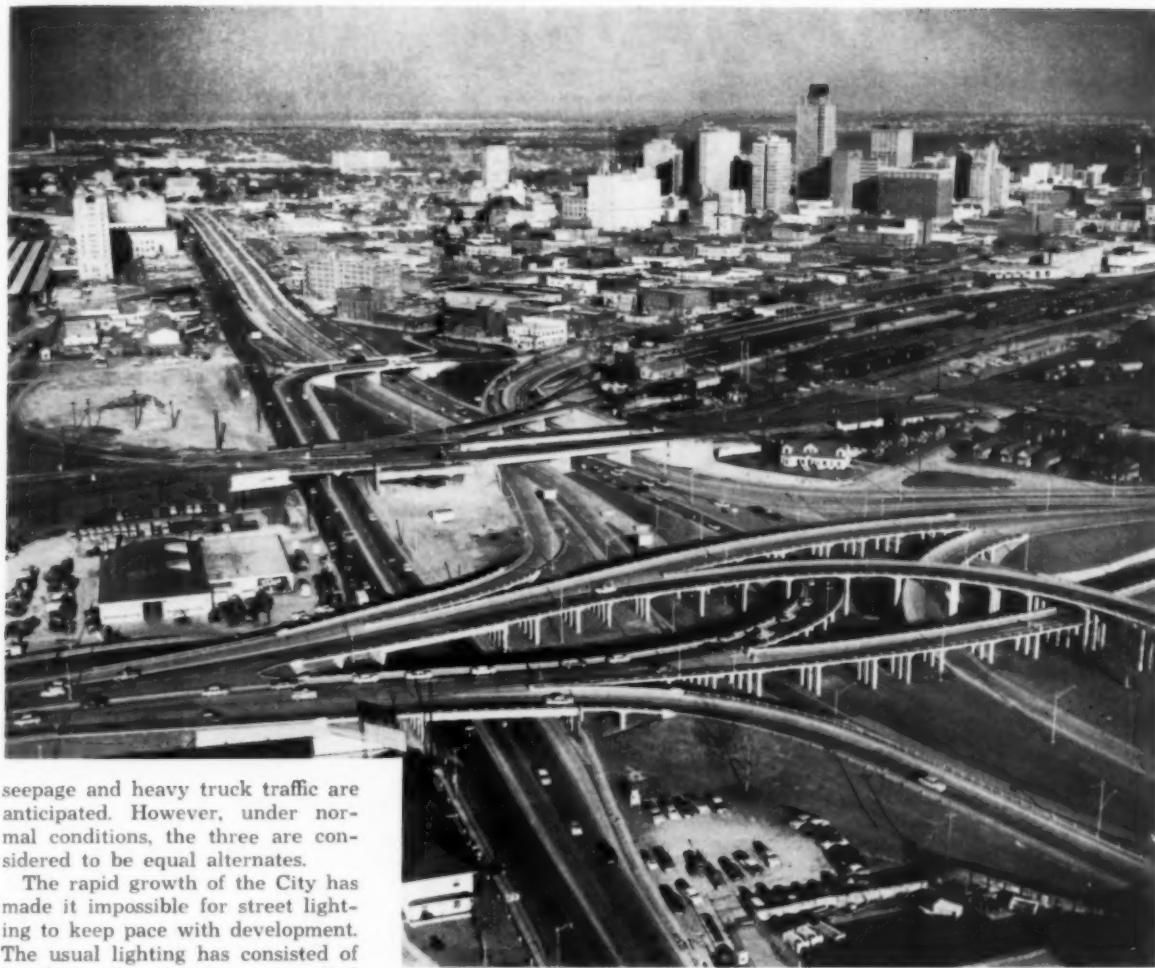
There are 32 streets included in this program as arterial thoroughfares which need to be widened from residential type streets to provide for additional traffic originating from various areas of the City.

These streets are generally composed of 30-foot roadways with temporary asphalt surfaces. It is proposed to widen them to 40-foot roadways (to permit two lanes of moving traffic and parking lanes) and to improve the pavement. A total of \$2,000,000 was included in the Bond Program for the City's cost, with approximately \$1,000,000 additional to be assessed against the property.

Generally, the roadway width of the major thoroughfares will be 60 feet on right-of-ways of 80 feet. When median strips and other traffic controls are constructed, the actual roadway and right-of-way widths are increased accordingly. At present, direct access will be provided for the adjacent property due to the prohibitive right-of-way cost in built-up areas and the increased cost to construct marginal access roads and other controls. However, studies are underway on the possibility of requiring access control in new undeveloped areas.

Usually the City requests bids on three different types of pavement on major thoroughfares: 1) $1\frac{1}{2}$ -in. hot mix asphaltic concrete surface on $3\frac{1}{2}$ -in. hot mix asphaltic concrete binder course on 10-in. crusher-run limestone base; 2) $1\frac{1}{2}$ -in. hot mix asphaltic concrete surface on $6\frac{1}{2}$ -in. reinforced concrete base; and 3) 7-in. reinforced concrete pavement.

The reinforced concrete alternates are preferred, particularly in cases where problems of underground



● THIS "MIXMASTER" interchange is part of Fort Worth's new highway facilities.

seepage and heavy truck traffic are anticipated. However, under normal conditions, the three are considered to be equal alternates.

The rapid growth of the City has made it impossible for street lighting to keep pace with development. The usual lighting has consisted of wooden poles with lamps installed by City forces at intersections. In cases of some major thoroughfares, the City has entered into contracts with the local electric power company, which installs and maintains the lighting system in exchange for a small fee per kilowatt hour of power used.

For many years, the conception of highways was to provide for traffic between cities. Now, the Texas Highway Department acknowledges that it has a responsibility not only to provide facilities for traffic to reach a city, but also to provide facilities for through-highway traffic inside cities. Because of this, extensive freeway, highway, and farm-to-market road construction is in progress and in the planning stage. The Five-Year Program incorporates these improvements, and proposed additional projects.

Right-of-way for state highways is acquired by Tarrant County under the supervision of the Highway Department, which pays one-half

the cost from state gasoline taxes. The County pays its one-half with funds received from the \$0.35 per \$100.00 property valuation right-of-way tax. Construction and engineering costs are paid for by the State. Right-of-way for highways and freeways designated as interstate highways is purchased by the Highway Department, with the Federal Government paying ninety percent of the cost. Engineering and construction is also financed ten percent by the State and ninety percent by the Federal Government.

Freeway pavement consists of either 10-in. reinforced concrete pavement or 1½-in. hot mix asphaltic concrete surface on 8-in. reinforced concrete base. Highway pavement consists of either 8-in. reinforced concrete pavement or 1½-in. hot mix asphaltic concrete surface on 6-in. reinforced concrete base. Farm-to-market roads usually are improved with a double asphalt surface on a 10-in. flexible

base. Marginal access roads are used to control access on freeways, while highways and farm-to-market roads are direct access constructions. Lighting for freeways is provided by the State, with the City responsible for maintenance and power. Freeways are from four to six lanes in width, with marginal access roads providing usually for two lanes of moving traffic and one for parking. Highway pavements and farm roads are usually 24 ft. in width, with shoulders on each side.

The Five-Year Program has been approved by the Fort Worth City Council and Tarrant County, and has been submitted to the Texas Highway Department. It is hoped that the Program will be completed within the five-year period. Many of the items proposed are needed immediately to provide for present conditions, and the others will be urgently needed to keep pace with the anticipated growth and expansion of the Greater Fort Worth area.

ROAD COMMISSION

vs. BEAVERS

JULES L. WAGMAN

MAN and Mother Nature are fighting to a draw over an unusual road maintenance problem in Wexford County, Michigan. About 10 miles west of the county seat of Cadillac, there is an industrious beaver colony which has dammed Wheeler Creek where it flows into a roadside ditch along North Lake Mitchell Drive. The result was a water-covered road all autumn long. The water cover is gone, at least temporarily, during the winter period. The drive around Lake Mitchell, a big resort lake, passes through the Wheeler Creek swamp at the southwestern corner of the lake, and that is where all the trouble is.

In years past, beavers have built other dams in the swamp area. A township road is now being built right over the top of one dam. But this is the first time a dam has caused the road commission so much grief. When the dam was first built, crews went in and took it apart. The industrious beavers were right back, rebuilding it even stronger than before. The commission then tried dynamite, and it worked well. Trouble was, the beavers went right back to work and rebuilt the dam.

Tourists Add to Traffic

The site has become quite a tourist attraction, for its dams the creek right in the roadside ditch with the road berm forming one shoulder of the dam. It's easily seen from the road, and city folk don't even have to get out of their cars to see it.

When ordinary modes of attack failed, the road commission enlisted the help of the State Conservation Department and County Conservation Officer, David (Pat) Pyers. A live trap was set at the dam and baited with beaver scent, (a musk removed from a female beaver's reproductive tract). Sure enough, Pyers picked off a young beaver in a day or two. Since he started trapping last September, Pyers has caught five beavers and transported them far from the scene, releasing them where they can dam to their heart's content without bothering man-made objects. Still, Pyers says,

there's quite a "slug" of beavers left and it will take lots more trapping to get ahead of them.

At the moment, the battle appears to be a draw. The dam, with a two-foot section torn out for several weeks, has not yet been rebuilt by the beavers. Still, they've backed up enough water so that the road com-

mission chief, Otto (Doc) Dahlgren, figures the best thing to do is put up signs, and there they are, warning motorists of a flooded area ahead. Road commission officials had hoped the situation could be brought under control before Spring runoff starts and more water is backed up by the pesky beavers.



● VIEW taken from inside automobile shows the sign erected to warn motorists.



● BATTLE may be a drawn one, but this picture seems to indicate that beavers are ahead for the time being. Breaking dam and trapping beavers have been ineffective.

PROCLAMATION

by His Honor, the Mayor of Princeton Borough

Be it proudly proclaimed that for ONE BIG WEEK

MAY 2 through MAY 7

There Will Be, in the Borough of Princeton, a Continuous Performance of

CLEAN-UP WEEK

OR

"DON'T SWEEP IT UNDER THE RUG MOTHER, THE BOROUGH WILL TAKE IT"

by the Citizenry of this Proud town

FEATURING

The Band of Blackhearted Villains — Trash and dust, dirt and rust, paper and mags, grease and rags

The Victors Triumphant — HEALTH, WELFARE and SAFETY and a Cast of Thousands of Stars, including each and every worthy, civic-minded Princetonian and his sisters and his cousins and his aunts.

THE SCENE

Everyman's Attic, Basement, Storage Room, Garage, Back Yard — and the neighborhood Alleys and Vacant Lots.



6 LIVELY ACTS

ACT I — The Clean-Up, or *Gee, I never dreamed it was that color!*

ACT II — The Pick-Up, or *The Collector Cometh*

SCENE 1 — *Rubbish and Refuse* will be collected on the regular days. Kindly stack it neatly at your curb.

SCENE 2 — *Paper Collection* (or *The American Legion Rides Again*). Monthly paper collection Sunday, May 1. Please cooperate.

ACT III — The Sweep-Up, or *Get the New Broom that Sweeps Clean!* Help the Lions' Club Annual Broom Sale — Proceeds Go to Aid the Blind.

ACT IV — The Paint-Up, or *Bring It Back Alive!* Inside and Out, paint freshens and protects your home and your furniture. Join the brush-swingers for a brighter Spring.

ACT V — The Fix-Up, or *The Turn of the Screw*. Up with the screens, off with the rust, here a nail, there a bolt, out with the hammer and oil-can and banish the ravages of Old Man Winter!

ACT VI — The Plant-Up, or *A Tree Grows in Princeton*. Nature's doing her job — Lend a hand with a few seeds, plants, a little fertilizer, some trimming and weed-pulling, and you'll soon be enjoying an even prettier place to live!

A Fine Performance Is Anticipated

Your Participation and Cooperation Will Be Greatly Rewarded

FOR FURTHER INFORMATION
CALL WA 4-3495

RAYMOND F. MALE,
Mayor of Princeton Borough

titled "Scene of the Play," with the added admonition, "Don't Let This Become the Scene of the Grime." Arthur T. Brokaw, Borough Engineer, who forwarded the Proclamation to us, comments that the effects of this special endeavor were most gratifying.

dusty villains and nostalgic typography, encouraged every citizen to become a Shining Knight in the Army of Civil Cleanliness.

In the original the Proclamation measures 9 1/2 by 16 inches. To add to its retention value the reverse side is printed with a map of the Borough

Among the more literate and original pleas for public cleanliness that have reached us recently is this Proclamation by the Mayor of Princeton, New Jersey, which was circulated throughout the Borough to publicize Spring Clean-Up Week. The Proclamation's melodramatic style, complete with

*When you consider an incinerator,
DON'T GET BURNED!*

Avail yourself of
MORSE BOULGER'S



YEARS' EXPERIENCE

MORSE BOULGER has built successful municipal incinerators for more years than any other organization.

Our latest is the recently completed installation for Somerville, Mass. with a capacity of 450 tons per 24 hours.

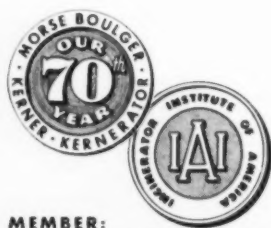
Whatever your waste disposal problem consult Morse Boulger for the answer.

SEE OUR EXHIBIT AT THE APWA SHOW

New York Coliseum, August 14 through 17

MORSE BOULGER, INC.

80 FIFTH AVENUE, NEW YORK 11, N. Y. • WA 9-8000
Incinerators — with air pollution control equipment



MEMBER:
*Incinerator Institute of America
Air Pollution Control Association*



NEWS BULLETINS

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

APWA ANNOUNCES PUBLIC EDUCATION PROGRAM

Chicago, Ill.—The American Public Works Association, through its Public Relations Committee, will launch within the next few months a very important public education program. The primary purpose of the program will be to foster a better understanding of the function and importance of public works in the community, to enhance the professional status of public works officials in government, and to help attract competent personnel to the field.

Rear Admiral Cushing Phillips, U.S.N. (Retired), and former president of the Board of Public Works, Los Angeles, Calif., is chairman of APWA's newly formed Public Relations Committee.

The week October 2-8, 1960, has been tentatively set aside as NATIONAL PUBLIC WORKS WEEK (proclamation pending) to recognize and publicize the outstanding work being done by public works engineers and administrators. It is hoped that the program being planned will help arouse an interest in the young people of this country to pursue careers in public service.

Through the cooperation of the Kiwanis International, activities are being planned for towns and cities across the nation to take part in the observance of NATIONAL PUBLIC WORKS WEEK. A complete kit is

being prepared which will contain sample proclamations for mayors to issue, radio, TV, and press releases; sample editorials, articles, window posters, speech material, a list of suggested activities such as parades, open-houses at local facilities, equipment displays, special luncheons featuring a public works speaker, etc. A public service film entitled "Headline for Harper" is also being produced for live and TV showings in connection with this program. This packet of materials will be available to all local Kiwanis clubs who wish to promote the observance of NATIONAL PUBLIC WORKS WEEK. Kits will be available from the American Public Works Association and from Kiwanis International.

Another very important part of the observance will be the selection of the "Top ten Public Works Men-of-the-Year." Anyone can nominate one or more candidates for consideration. The persons to be selected are those whose work reflects the highest standards of professional conduct for public works officials; whose achievements are noteworthy in relationship to the manpower and financial resources available; and to those individuals who have discharged important responsibilities in connection with the design, construction, maintenance and/or op-

eration of a major public works project or activity. The final selection will be made by a committee appointed by APWA President Jean L. Vincenz.

The American Public Works Association is very proud to put forth this public education program in behalf of its many members and other public works officials who are doing outstanding work with little recognition. The APWA feels that the ability of government to attract and hold good men depends to a great extent upon the people's attitude toward their public servants. It is hoped this nationwide program will help in elevating the status of public works engineers and administrators in the eyes of their respective communities and in stimulating greater civic pride in our system of local self government.

Others who have accepted appointment to the committee are: Hon. Ben West, Mayor, Nashville, Tenn.; Milton Rosen, Commissioner, Dept. of Public Works, St. Paul, Minn.; Paul R. Screvane, Commissioner, Dept. of Sanitation, New York, N.Y.; Col. W. A. Hardenbergh, President, PUBLIC WORKS Publications, Ridgewood, N. J.; Stanley C. Palmer, City Engineer, Kansas City, Mo.; James F. Steiner, Mgr., Construction and Civic Development Dept., Chamber of Commerce of the United States, Washington, D.C.; Robert B. Bradford, Director, Dept. of Public Works, State of California, Sacramento, Calif.; and Roy W. Morse, City Engineer, Seattle, Wash.

OFFICERS: Jean L. Vincenz, San Diego, Calif., *President*; Frederick W. Crane, Buffalo, N. Y., *Vice President*. REGIONAL DIRECTORS: (term ending 1960) Charles W. Cooke, Hartford, Conn.; R. S. Hopson, Richmond, Va.; H. H. Hester, Fort Worth, Texas; (term ending 1961) Louis H. Moehr, Wyandotte, Mich.; John A. Morin, Oakland, Calif.; Roy W. Morse, Seattle, Wash.; (term ending 1962) Paul R. Screvane, New York, N. Y.; Albert G. Wyler, New Orleans, La.; Edward J. Booth, Bismarck, N. D. *Immediate Past President*, Wm. D. Hurst, Winnipeg, Manitoba. Robert D. Bugar, *Exec. Director*.

CLARK SERVICE BOXES

Neat - Safe - Permanent



H. W. CLARK CO.
MATTOON, ILLINOIS

Consultation Clinics To Be Held At APWA's New York Congress

Chicago, Ill.—APWA's annual Congress and Equipment Show will be held in New York City's Coliseum August 14-17. Over the last few months we have tried to keep officials in the public works profession fully informed on what is taking place to make this the biggest and best Congress and Equipment Show ever sponsored by the APWA. We have covered technical sessions and topics of special interest, speakers, exhibits, pre-registration, post Congress tours, prizes and souvenirs, special attractions, social events and entertainment, and many other miscellaneous facts of interest. If there are any questions about the Congress which we have not answered, we hope you will write us direct. If you know of anyone who is in doubt about going, we hope you will help him to make up his mind to the affirmative. This will undoubtedly be one of the biggest public works events of 1960.

A new feature this year which we haven't mentioned are the consultation clinics to be held August



● NIGHT or day, New York City will fascinate visitors attending the 1960 APWA Congress and Equipment Show.

16th and 17th. Here is an opportunity to discuss individual public works problems with a panel of leading authorities in five different branches of the public works profession. Clinics will be set up to handle questions on the following subjects: (1) streets and highways; (2) water and sewage; (3) solid wastes (garbage and rubbish); (4) equipment; and (5) buildings and grounds. The principal purpose of the clinics is to give members in attendance an opportunity to get practical advice from other public



THREE MEN ON A WORKHORSE save utility \$900 in 10 days

Slashing \$905.60 from a utility's construction and maintenance cost in a 10-day comparison period is no small accomplishment.

Yet it was easy. Holan's Three-Man Crew Unit went into the field and did the work of five men. Labor costs were drastically reduced—and two men were freed for other work assignments.

The three men used the spacious Holan CM-138 Line Construction Body equipped with a powerful, single-cylinder Model 25-C Derrick and 4401-H Earth Borer.

The five-man crew traveled in a line construction body with crew compartment. A two-legged derrick was used, but all digging was done manually.

The cost comparison was made on such jobs as

setting, removing and loading poles, digging anchor holes, pulling butts and installing pole facilities.

Write today for more information on Holan's Three-Man Crew Unit—the body-derrick-digger combination that conserves manpower and saves you money.

Holan Corporation, 4100 W. 150th St., Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Ariz.

Holan 
Subsidiary of THE OHIO BRASS COMPANY 



HERE'S HOW YOU CAN GET MORE DITCH PER DOLLAR!



Photos above show the versatile Vermeer 4T POW-R-DITCHER digging a gas main trench. Manufactured for the light construction field, this small, inexpensive ditcher is excellent for water and cable lines and home foundation footings.

RUGGED, LOW COST 4T POW-R-DITCHER DIGS 6"-14" WIDE DOWN TO 4½' DEEP

The small powerful, ruggedly built Vermeer 4T POW-R-DITCHER is designed especially for contractors, municipalities, utilities, institutions and custom operators. Only 46" wide, the 4T is fast . . . and highly maneuverable. One-man operated, the POW-R-DITCHER is self-propelled, has two-way dirt conveyor and hydraulic track drive. Handles most ditching jobs at a fraction of the cost of more expensive ditching machinery.

IDEAL FOR LAYING GAS PIPE, WATER AND CABLE LINES AND FOR HOME FOUNDATION FOOTINGS

The 4T POW-R-DITCHER is the finest buy on the market when you want a low cost investment, low maintenance cost and high production. Capable of handling most ditching jobs, the 4T is a real workhorse!

Please send me FREE information and prices on the complete line of self-propelled Vermeer POW-R-DITCHERS.

NAME _____
TITLE OR DEPT. _____
FIRM _____
ADDRESS _____
CITY _____ STATE _____

VERMEER MFG. CO.
1439 W. WASHINGTON, PELLA, IOWA

works officials who have been confronted with the same or similar problems.

The hours from 11 a.m. to noon and from 1 p.m. to 2 p.m. have been set aside on Tuesday and Wednesday for this purpose. The clinics will be held in five separate rooms

conveniently located off the main exhibit floor in the Coliseum.

All members planning to attend the Congress should be thinking now of problems that have been causing them difficulty and be ready to present them to the appropriate panel. It is quite likely that some

The Educator's Place in APWA

There is considerable evidence that the common interests of the APWA and the educator are being more clearly identified. Communication between the public works official and the professor is quite obviously increasing. Recent programs of the annual APWA Congress and those of the several chapters show many appearances of educators and discussions of educational concern. Moreover, the year-round activities of APWA show that educational matters are taking on an increasing importance.

The nature of our times makes this both good and necessary. The educator-APWA relationship is to the benefit of both. To teach and research effectively, the professor needs recourse to the laboratory of public works experience, but just as importantly, the public works official must keep abreast of new knowledge and theory if the pace of technological change in material and method is not to leave him behind.

Engineering schools have always had a clear place in the preparation of men for careers in public works, but it seems to me that not only has a new dimension been added in engineering training, but also, that other resources of the universities and colleges are being brought to bear on the whole field of public works. An outstanding instance is in the field of management and administration. In the years ahead, I foresee the educator and the APWA working closely together in this area. Donald Stone, Dean, School of Public and International Affairs, University of Pittsburgh, and member of the APWA since 1930, pointed out long ago, that public works is management as well as engineering, and all of us who have responsibility for organizing and directing the efforts of others know that our problems of human relations, communications and training are becoming complex and important.

The APWA and several of its chapters are to be commended for their sponsorship of courses which recognize these important other elements in the public works function. In collaboration with educational institutions, such courses are pointing the way toward mutual gains for both the institutions and APWA. I should like to see many more chapters and many more educators involved in this effort.

I believe our colleges and universities are now more research-minded and more community-minded than they have ever been. The APWA is making more progress than it ever has in developing a sense of professional unity among its members. There will be great gain for both the educators and APWA as these parallel developments are brought into focus in the field of public works. New methods, expanding research, newer skills in human engineering, can add up to provide the take-off for coping with the complexities of modern public works. The movement toward increased collaboration between APWA and the educator reflects credit on both.

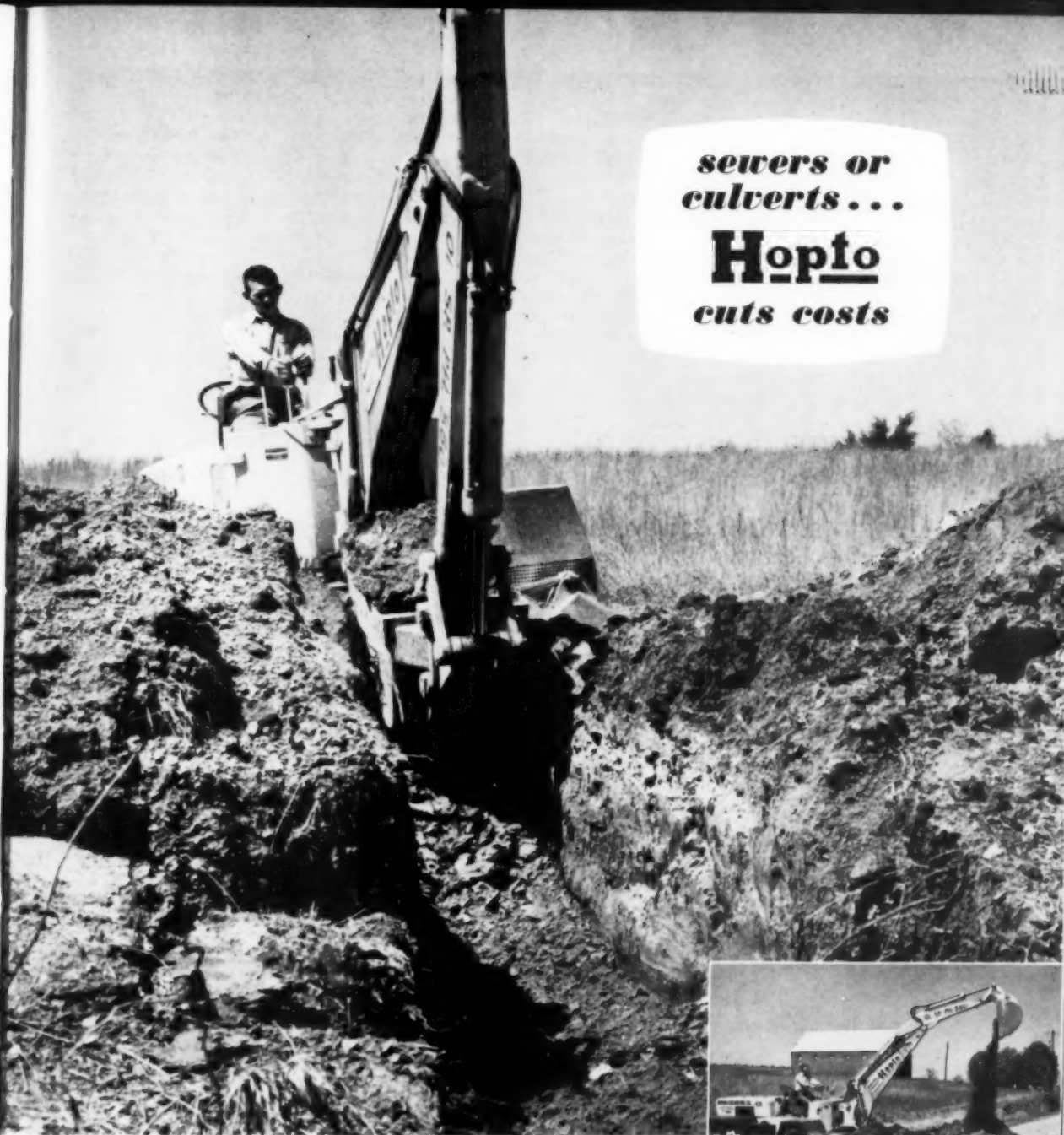
William G. Willis



William G. Willis is a professor of political science and director of the Institute of Local Government at the University of Pittsburgh. He is president of the Western Pennsylvania Chapter of APWA and has been a member of the Association since 1949.

*sewers or
culverts...*

Hopto
cuts costs



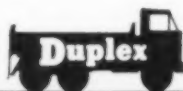
Hopto Model 200 SPR all-hydraulic backhoe is a versatile, one-man machine with easy job-to-job mobility. There's no tail swing — Hopto can work in close quarters where other excavators can't be used. Your Warner & Swasey dealer can show you why Hopto is your best investment . . . ask him to arrange a demonstration.



Distributors in over 75 principal cities in the United States and Canada

Hopto[®]

WARNER & SWASEY
BADGER DIVISION • WINONA, MINNESOTA



of the panel members have been faced with these same problems and their suggestions could be of considerable value to you.

This year's Congress will take place in one of the world's most exciting cities. The Coliseum is approximately ten minutes from the Headquarters Hotel, the Astor and the Manhattan. Complimentary shuttle bus service to the Coliseum will be provided from the Hotel Manhattan. The exhibit areas and meeting rooms are fully air conditioned.

To insure the success of the 1960 Congress, prominent, highly quali-

fied speakers have been invited to present their views on current issues. The Hon. Robert Moses, long-time construction coordinator for New York City, will deliver the banquet address. John Kenneth Galbraith, Professor of Economics, Harvard University, and author of *The Affluent Society*, will give the keynote address. Many other prominent public works officials will be participating including Mr. A. Bjorkman, Director of Public Cleansing, Stockholm, Sweden.

Ultra-modern and air conditioned, New York's Coliseum, on Columbus Circle, provides an ideal market-

place for displaying and viewing public works equipment. Over 125 manufacturers have reserved exhibit space, making this one of the largest and most diversified equipment shows yet sponsored by APWA. It is a unique opportunity to compare relative merits of equipment and supplies continually being designed to increase efficiency and reduce costs of governmental operations.

The Local Committee is under the Chairmanship of Paul R. Screvane, Commissioner, Department of Sanitation.

President Vincenz Commends New Orleans Members

New Orleans, La.—Speaking at the May 4th Meeting of the New Orleans Chapter, New Orleans, APWA President Jean L. Vincenz, commended the Chapter for undertaking the Metropolitan New Orleans Transportation Plan.

The New Orleans Chapter recently adopted a resolution to undertake a study of the transportation problems of the metropolitan area of that city. The handbook prepared by the National Committee on Urban Transportation, was adopted as an outline and guide for the study.

Regarding committee activities, Vincenz suggested studies pertaining to specifications on trench methods, installations of sewers, and location of underground utilities as applicable to local needs.

Newly elected officers at the May meeting include: Owen V. LeBlanc, president; John J. Porte, assistant engineer, vice-president; Edwin A. Bachemin, assistant engineer, secretary-treasurer; and Charles F. O'Daniel, Jr., director of planning, and James L. Champagne, administrator, members-at-large.

Grady Carlisle, assistant to the director of the Louisiana State Department of Highways, guest speaker, talked on "The Louisiana State Highway Department, and the New Orleans Metropolitan Transportation Program."

• • •

Repairing Street Cuts

The Street Division of the Fort Worth, Tex., Public Works Department repaired 1,768 pavement cuts in the 1959 fiscal year. Of these, 1,182 were plumber cuts, 162 were water company, 195 were sewer division and 130 were light division. For repair, 4,225 sq. yds. of asphalt resurfacing and 4,594 sq. yds. of permanent paving were required.

control



for algae and aquatic weeds

In small amounts, Triangle Brand Copper Sulfate controls algae growth and kills some of the more troublesome aquatic weeds. They disintegrate where they are, which prevents downstream infestation or clogged waterways.

In sewage pipes, Triangle Brand Copper Sulfate can be used in such

low concentrations to control root and fungus growth that surface trees remain unaffected.

Two informational booklets, "The Use of Copper Sulfate in the Control of Microscopic Organisms," and "Copper Sulfate for Root and Fungus Control in Sanitary Sewers and Storm Drains," available on request.

Phelps Dodge

300 PARK AVENUE,



Refining Corp.

NEW YORK 22, N. Y.



The more you know about microfilmers the more you'll marvel at this one!

New RECORDAK RELIANT 500 Microfilmer holds more surprises for you than any other microfilmer ever built!

First surprise is its trim, good looks—only half the size you'd expect a large-volume microfilmer to be... and better styled than any microfilmer you've ever seen.

Now... get out your stop watch. In 1 minute it photographs the fronts and backs of up to 500 items... indexes the film... even cancels or endorses when accessory RECORDAK endorser is used.

Listen... you'll hear only the hushed "tat, tat" of the counter ticking off the number of microfilmed documents pouring in sequence into the front receiving tray.

RECORDAK®

(Subsidiary of Eastman Kodak Company)
originator of modern microfilming
—now in its 33rd year

IN CANADA contact Recordak of Canada Ltd., Toronto

PUBLIC WORKS for August, 1960

Look... and you see that your operator can handle more work, more efficiently than ever before. Precision controls guard against "double feeding"... supervise machine performance from start to finish.

Everything's so easy—for example, operator simply slides out film unit to load film or to substitute film unit with a different reduction ratio. This *instant changeover* of film units also lets various departments microfilm with their own units—reducing need for extra microfilers, and unitizing the work.

.....

RECORDAK CORPORATION Y-8
415 Madison Avenue, New York 17, N.Y.
Send free 4-color folder describing new RECORDAK
RELIANT 500 Microfilmer.

Name.....Position.....
Agency.....
Street.....
City.....State.....

THE HIGHWAY AND AIRPORT DIGEST



Prepared by L. G. BYRD, Associate Editor

Highway Organization Management

The rapid progress of technology has not always been matched by equal progress in administration and management in highway organizations. While no set of principles are specifically designed for highway administrators the AMA "commandments" specify that a good organization always: 1) Defines responsibilities; 2) sees that authority accompanies responsibility; 3) keeps all informed of changes in responsibility; 4) limits each participant to one boss; 5) allows no one to give orders to another's subordinate; 6) requires criticism of subordinates in private; 7) provides prompt settlement of disputes over responsibility; 8) requires that each superior pass upon promotions or disciplinary action affecting his subordinates; 9) avoids asking subordinates to criticize their superiors; and 10) provides adequate help to facilitate continuous self-checking by each executive. As in business, there is a growing awareness in government of the need for improved management services.

"How Does Your Organization Rank in Management?" W. L. Hass, Consulting Engineer, Madison, Wisconsin. *Better Roads*, June, 1960.

Basic Facts About Emulsified Asphalt

Asphalt emulsions—the dispersions of very small drops of asphalt in an aqueous medium—are used in road construction and maintenance, soil stabilization and for various special uses where cold application of asphalt is desirable. Clay emulsions include those prepared with an aqueous dispersion of a mineral, the most widely used material being bentonitic clay which possesses remarkable colloidal properties. Emulsions made with bentonitic clay set

and dry rapidly (drying from the bottom up); they have improved flow properties but the presence of the clay may result in increased water imbibition during service. Anionic emulsions contain asphalt droplets, the surfaces of which are negatively charged. The resistance of these emulsions to breaking is dependent upon the kind and amount of emulsifier and stabilizer present in the colloidal system. The new cationic emulsions carry positively charged asphalt droplets, show rapid initial set and are claimed to have unusual ability to adhere to certain types of aggregates. Stability of any asphalt emulsion is dependent on: 1) Concentration of the asphalt phase (viscosity of the emulsion); 2) size of the asphalt droplets; 3) particle size distribution; 4) pH value of the aqueous phase; 5) surface tension between the asphalt and aqueous solution; 6) nature and concentration of the stabilizing agent; 7) freezing of the aqueous

phase; 8) heating to temperatures above 150°F; 9) contact with electrolytes or any substance which will change the pH value; 10) mechanical agitation of the finished emulsion; 11) sedimentation or creaming of the asphalt particles; and 12) putrefaction of protein stabilizer. Viscosity of an emulsion decreases with dilution or decrease in asphalt.

"Some Basic Facts About Emulsified Asphalt." R. N. Traxler, Research Engineer, Texas Transportation Institute, College Station, Texas. *Roads and Streets*, June, 1960.

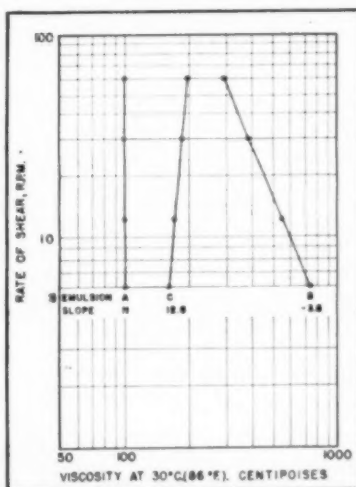
Roadside Weed and Grass Control

Along with an interest in appearance—particularly in "tourist" states—highway maintenance organizations must give consideration to economy, safety and efficiency in developing a program for weed and grass control. Some states have employed chemical control as an effective and economical tool in turf maintenance. Programs include use of chemicals for soil sterilization, brush control and weed control. Mowing is still the most widely used method of grass and weed control with four basic types of mowers now in use: sickle bar, reel, rotary and hammer knife.

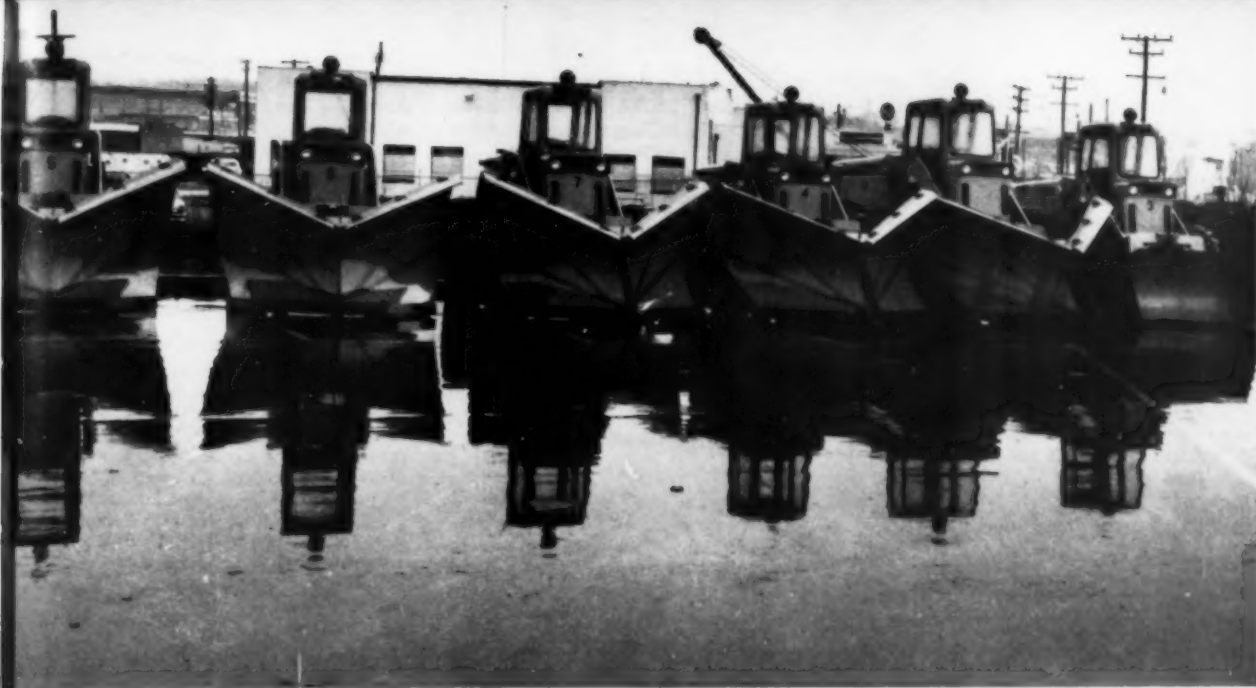
"Roadside Weed and Grass Control." J. D. Culea, La Grange, Illinois. *Rural Roads*, June, 1960.

Bridge Widening Program

Since July, 1955, 1,030 bridges have been widened or replaced under an Indiana Highway Department program totalling \$3,315,096.45. Work has covered almost every type of structure modification including: Replacement by precast, prestressed slabs; widenings by precast prestressed slabs; replacement by corrugated metal pipes and arches;



● SOME of the rheological relationships of emulsified asphalts, as discussed in the accompanying abstract.



6 Michigans for Baltimore Highway Dept.

City set for crippling snow storms, meanwhile speeds road repair, landfill work

Like many communities south of the Snow Belt, the City of Baltimore, Maryland, needs heavy-duty snow removal equipment only occasionally. Specialized units just aren't economical. Yet, at times, only their efficiencies can unblock a snow-plugged city.

Obviously, this need can best be filled by machines which are good snow fighters as well as good dirtmovers. Baltimore's choice is Michigan Tractor Shovels—six of them!

Snowbound . . . never again!

This vital selection was triggered by a "once-in-a-lifetime" snowstorm of two years ago. It stopped traffic for three days . . . kept most of the city's 982,000 people from leaving their homes. When streets were finally cleared—and the discomfort, inconvenience, and fire danger over—the City Government vowed, "Never again!"

Soon, they had written a 375 page master snow removal plan. Some 90 new plows were bought to attach to their trucks and graders. For fast clearing of the main trouble spots—405 linear miles, 1665 plow miles of principal streets and intersections—in came the six powerful, high-speed Michigans.

The main advantages of these units has proved to be their *dependability, speed, and versatility*. Equipped with plows, each four-wheel-drive, power-steered, torque-converter machine can clear a path 8 to 9 ft wide. With buckets—which interchange simply by removing four pins—units speedily load windrowed snow. And, in summer, they speed all kinds of dirtmoving and maintenance jobs . . .

Assigned to street crews

Five of the machines—all 2 yd Model 125A's—are assigned throughout the dirtmoving season primarily to road repaving and grading crews. They shuttle at traffic speeds from job to job, clearing old pavement, digging and loading dirt, handling road material, etc.

One Michigan speeds cleanup at three scattered sites

The sixth Michigan, a 2½ yd Model 175A, handles cleanup and coverage at *two* landfill garbage dumps *AND* cleanup around a city incinerator. This 27 mph rig shuttles between sites under its own power . . . does and covers an average of 100 truck-loads of street dirt, tin cans and incinerator ash per 8-hour day.

"This rig—and our other Michigans—are doing a fine job!" says George V. Walters, Baltimore's general superintendent of highways. "The machines were purchased and delivered Sept 24, 1958, and as of this date we have had no tire troubles. Distributor service (from Paying Supply & Equipment Co) is excellent! We think every city could do well to investigate the fast, high-speed, dependable Michigan line!"



On typical landfill assignment Michigan dozes refuse over bank. Later the 2½ yd rig will dig bank-run gravelly sand and carry it in for cover. Compaction is achieved during normal dozing both before and after coverage.

Michigan is a registered trademark of

CLARK EQUIPMENT COMPANY
Construction Machinery Division



2499 Pipestone Road
Benton Harbor 29, Michigan

In Canada:
Canadian Clark, Ltd.
St. Thomas, Ontario

widening with corrugated metal pipes and arches; and widening by removal of handrails and replacement with guardrails. Bridge crews have developed efficiency that has enabled them to complete emergency replacements with traffic closures of as little as 8 hours in some instances. Marked improvements in accident records and driving comfort resulting from the program have won the appreciation of the people of Indiana.

"Bridge Widening Program Gets Public Praise." Charles D. Miller, Field Engineer of Maintenance, Indiana State Highway Department. PUBLIC WORKS, July, 1960.

Lighting Reduces Accidents

Two years ago the Baltimore, Md. Street Lighting Division began a program to install modern luminaires on all city bridges over 100 feet in span. By January 1960, all but 8 of the more than 130 structures were brought up to IES standards. Lighting affords 1.2 foot-candles of illumination on standard bridges, 1.0 foot-candles on thoroughfares and 0.8 to 0.9 on expressways. Most new luminaries are Westinghouse or General Electric

mercury vapor units ranging in intensity from 10,000 lumens to 35,000 lumens depending upon bridge width and traffic density. Average lighting maintenance cost is \$750 per year per 1000 feet of bridge. Accident reduction, while attributable in part to concurrent improvements in geometric design, ranged as high as 85-90 percent in several locations.

"Accidents Reduced by Bridge Lighting Program." William F. Hallstead. PUBLIC WORKS, July, 1960.

Paving by Assessment

Property-owners petitions, followed by engineering department plan preparation, public hearings, city council ordinance, issuance of notice of special assessment and solicitation of bids, precede the award of a contract and the initiation of construction of new pavements in Peoria, Illinois. After completion of required drainage facilities and concrete curbs and gutters, a soil-cement base is constructed by: Scarification; pulverization; application of cement; dry mixing; application of water; wet mixing; compaction; and curing. The base construction, aside from curing, is completed on an average 27-ft. wide

by 800-ft. long section in one 8-hour day. The base is surfaced, after a minimum 7-day curing period, with a 1½-in. bituminous concrete surface course.

"Residential Street Paving by Special Assessment." Richard R. Hines and B. J. Adkins, Engineering Department, Peoria, Illinois. PUBLIC WORKS, July, 1960.

Other Articles

"Subsurface Bedrock Along Highway Route Mapped by Seismograph." Newly developed miniature seismograph develops accuracy within 5 percent in preliminary survey of subsurface material along proposed Minnesota highway route. By W. R. Liebenow, Materials Engineer, Ellerbe and Company, St. Paul, Minnesota. PUBLIC WORKS, July, 1960.

"Surveying Keeps Pace With St. Paul's Growth." Current well-organized program still benefits from careful establishment of bench marks placed 60 years ago. By Edward L. O'Connor, former Assistant Chief Surveyor, Public Works Department, Saint Paul, Minnesota. PUBLIC WORKS, July, 1960.

"The Role of Research in Civil Engineering." Research in physical and social sciences will provide the civil engineer with new and better tools for his professional practice. By Morrough

(Please turn to page 143)

BAUGHMAN SALT, SAND and CINDER SPREADER

SAFETY CHAMPION FOR STREETS AND HIGHWAYS
choice of 4 drives

PTO with { Mechanical Operation
Hydraulic Operation

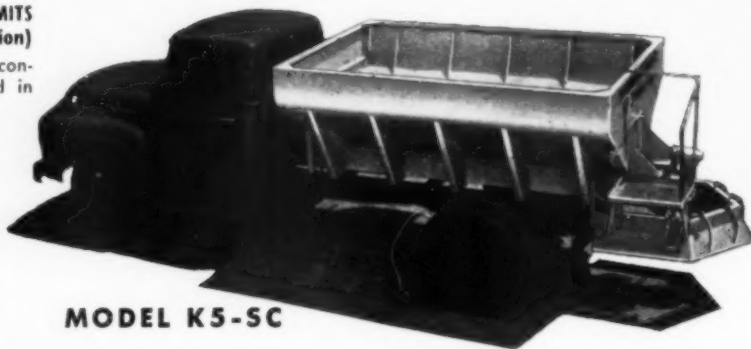
Auxiliary Engine with { Mechanical Operation
Hydraulic Operation

CAB CONTROLLED VACUUM CLUTCH PERMITS SPOT SPREADING (on mechanical operation)

Completely sealed, vacuum operation, controlled from cab. Start or stop spread in motion, as at intersections, safety zones. On hydraulic operation models, spot spreading is controlled by by-pass valve.

TWO-SPEED "QUICK CHANGE" MECHANISM

Simple sprocket and chain drive: low for chemical spreading, high for large-volume spreading. No need for expensive automotive transmission. On hydraulic operation models, spreading volume is valve controlled.



MODEL K5-SC

WRITE FOR NEW ICE CONTROL CATALOG!



BAUGHMAN MANUFACTURING COMPANY

308 SHIPMAN ROAD

JERSEYVILLE, ILL.

clean, safe
WATER
for generations to come



Our nation's population growth requires water—clean water, and lots of it! Controlling pollution of lakes, streams and rivers means better public health and water supplies, new and improved vacationlands abounding in fish and wildlife. Local industries also benefit from unpolluted water supplies. Up-to-date sewage treatment facilities insure these continuing benefits. The following cases show actual benefits achieved by planned water pollution control.



Everybody benefits from clean water

Abundant usable water is every American's birthright—and responsibility! Modern living takes good water away...modern technology alone can restore it.



Clean, sparkling river water flowing into Wyoming's Glendo Reservoir makes it a great place for water sports!

The Glendo Reservoir on the North Platte River was ideal for recreation except for the untreated sewage being poured into the river by every town for 100 miles upstream. Then they all joined in a highly successful clean-up campaign. Ridding the

river of dangerous wastes not only took care of a serious public health problem—it gave everyone a delightful new recreation attraction after the dam was built. Boating, swimming and fishing bring many vacationers to the area each year.



"They're catching bass in the Walnut River for the first time in 35 years!" say local fishermen. Oil field, refinery and municipal wastes spoiled one of the prettiest rivers in southern Kansas. But the communities and industries along the Walnut River set up a *pollution abatement program* and each cooperated to carry it out. They've built new sewage treatment plants, eliminated oil field brines and set up waste treatment facilities at refineries. The river is being returned to its original beauty—a natural resource to be proud of!



"Our water clean-up brought us new industry and jobs," says Mayor J. E. Keech, Cumberland, Maryland. The city built a new sewage treatment plant (above) that will take care of all home and factory wastes, even with the growth expected in the next ten years. And that's one important reason Pittsburgh Plate Glass Company came to Cumberland! Their new factory will bring jobs for nearly a thousand people.



Right next door to luxury homesites ... treatment plant doubles as popular marina!

An attractive and useful asset to the community is the sewage treatment plant at Clearwater, Florida. Its appearance would do credit to a fine yacht club. There are 45 boat slips for public use

at the Marina Station. Planned for the future, the plant's capacity for treating wastes will be more than adequate for the population expected when the area is fully developed.



Treatment plant on a boulevard wins favor for engineers and city officials



HERE'S HELP IN GETTING PUBLIC SUPPORT FOR ACTION ON POLLUTION PROBLEMS IN YOUR AREA

The pages you have just read relate a story that needs telling to the public. That's why PCA is reprinting this colorful insert—with a new fourth page—folded for easy mailing (shown at right.)

This mailing piece is available in quantity for use locally where help is needed to inform the public as to the urgency for obtaining adequate pollution control facilities.

For further information about this folder, or for help of any kind in planning your clean-up programs—just call on PCA.

PORTLAND CEMENT ASSOCIATION
33 West Grand Ave., Chicago 10, Illinois



The Coral Gables, Florida, sewage treatment plant is truly a civic showplace. Walls are decorated with colorful scenes by famous artist John St. John. A well-designed, odor-free treatment plant is a credit to a community wherever it's located!



**MODERN
concrete**

A national organization to improve and extend the uses of concrete

Highway and Airport Digest

P. O'Brien, Dean Emeritus, College of Engineering, University of California Civil Engineering, June, 1960.

"How to Get Quality Concrete." Concrete is the only major element of most structures that is manufactured at the site. It requires the same knowledge and know-how—in all components of the concrete industry—as are now applied to other basic construction materials such as steel and glass. By J. J. Manning, Managing Director, The Concrete Industry Board, Inc., New York, New York, Civil Engineering, June.

"Parking Conditions and Habits Near Expressway Interchanges." There is evidence of a growing need for parking provision in the vicinity of interchanges, as revealed by a study of interchanges along the Merritt Parkway in Connecticut. By Michael T. Gruenbaum, Research Associate, Yale University and Peter Powers Hale, Vice President, Technical Planning Associates, New Haven, Connecticut. Traffic Engineering, June, 1960.

"Some Things That Have Helped Our Street Cleaning." Vacuum leaf picker-shredder, late-night parking ban and good route management improve program in tree-studded Ann Arbor, Michigan. By Frederick A. Mammel, Superintendent of Public Works, Ann Arbor, Michigan. Street Engineering, June, 1960.

"Public Transport in Five Great Metropolitan Areas—Part I." This is the first section of a three-part report on public transportation in New York, Chicago, Philadelphia, Boston and Cleveland, uncovering principles applicable in smaller metropolitan areas. The American City, June, 1960.

"Kalamazoo Merchants Pay for Big Relighting." High intensity street lighting installed along three business streets financed by assessment against abutting property owners. By Richard Gorman, Utilities Engineer, Kalamazoo, Michigan. The American City, June, 1960.

"Slurry." The emulsified asphalt seal coat as developed by the County Road Department, Los Angeles County, California. By Frederic Hokin, Civil Engineer, Road Department, Los Angeles County, California. Rural Roads, June, 1960.

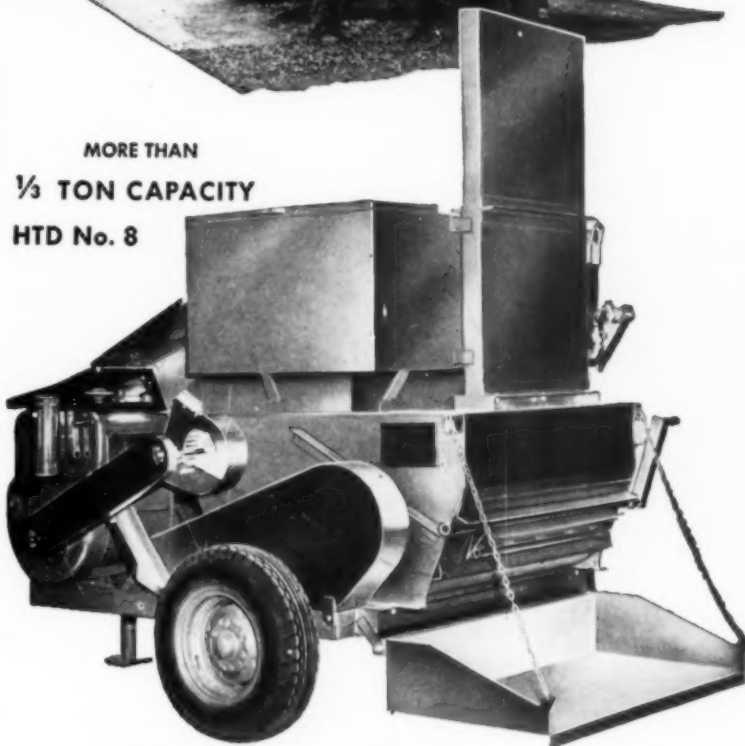
"All-Out Modernization Transforms Jersey U. S. 1." Synchronized signals are part of a coordinated program for this jam-packed truck route. Roads and Streets June, 1960.

"Economical Grade Separations for Low-Density Roads." Use of Armco Multi-Plate by the Wyoming highway department. By C. E. Gattis, Resident Engineer, Wyoming State Highway Department. Roads and Streets, June, 1960.

"Electrical Heating of Roads." Study of experimental installations in England. By A. C. Whiffin and W. I. J. Price, Road Research Laboratory, Department of Scientific and Industrial Research. Roads and Road Construction, May, 1960.



MORE THAN
1/3 TON CAPACITY
HTD No. 8



McConnaughay OFFERS
the most complete line of
Asphalt Patching Mixers

3 TO 20 TONS QUALITY HOT MIX PER HOUR

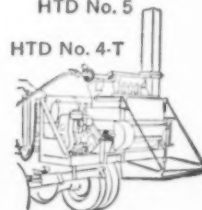
Here are the mixers you need for fast, economical pavement repairs and small surfacing jobs... in any season... under wet or dry conditions. They are precisely engineered and rigidly constructed to handle on-the-job mixtures of asphaltic concrete, sheet asphalt, sand asphalt or mastic asphalt... hot or cold... at remarkably high rates. They will enable you to meet all conditions with least effort and at lowest possible costs. Write for complete specifications and proportioning tables.



HTD No. 10



HTD No. 5



HTD No. 4-T

McCONNAUGHAY MIXERS, INC.
LAFAYETTE, INDIANA

National distributors: Asphalt Equipment Co.
3314 Cherry Lane, Fort Wayne, Indiana



ROCK AND ROLL?

Not with Allis-Chalmers Utility Tractors

To get better balance, you spread your feet . . . that's just what Allis-Chalmers has done with a longer wheel base, and you still get the most maneuverable rig in its power class.

For maximum stability, you keep weight low . . . Allis-Chalmers does just that, the low profile shows it clearly . . . yet there's plenty of clearance under the axles.

When you choose an Allis-Chalmers utility tractor, you get a clean rig, free from frills, easy to service . . . and set for the job in minutes. Put your investment in *working design* that saves money on every job.

Get all the facts on Allis-Chalmers utility tractors. It doesn't cost to find out!

D-10 • D-12 • D-14 • D-17

Utility tractors from 34 to 63 engine horsepower
with companion equipment to match your needs!

ALLIS-CHALMERS

ALLIS-CHALMERS MFG. CO

Utility Tractors & Equipment, Milwaukee 1, Wisconsin

Please send me more information about Allis-Chalmers utility tractors with ☐ backhoe ☐ loader ☐ fork lift

Name _____

Firm _____

Address _____

City _____ State _____

SOLD BY ALLIS-CHALMERS DEALERS EVERYWHERE

TRAFFIC CONTROL PROBLEMS AND SOLUTIONS

From the Annual Report of

JOHN F. PLETNIK,
Traffic Coordinator,
Youngstown, Ohio

MOST OF THE more than 190 traffic signals in the city of Youngstown, Ohio, alternate colors at fixed intervals without any regard to the increase or decrease in the amount of traffic on intersecting streets. The timing of the traffic lights is set according to traffic flow and, by time-clock devices, it is possible to operate them on different controller dials which will change as scheduled for the preferential traffic movement during the day.

This works fairly well when the flow of traffic is constant and predictable, yet by nature traffic is not predictable. The most elaborate time clock has no way of adjusting itself to special situations caused by slippery streets, a rainy day, special events, an accident or a fire. During unusual situations, a fixed time signal will pile up traffic more and more until it is necessary for a traffic officer to begin the painful job of untangling the traffic jam.

We need signals that will adjust themselves moment by moment to what is actually happening on the streets. Electronics have now made such devices possible and traffic actuated signals in their highest form virtually think for themselves.

An even more intelligent device is the traffic density controller which has its detectors placed several hundred feet back from the crosswalk. These supply its electronic brain center with advance information about the movement of vehicles approaching on each street and the spacing between them so that it can time the length of the red and green indications accordingly. These controllers have memory circuits which store up the records of traffic spacings and density at different times of the day, and they can actually anticipate and plan ahead on the basis of past performance.

Another type of controller is the cycle selector which can supervise traffic signals over a very large area, changing them step by step to conform to the density, direction and speed of vehicles moving on many streets at a given time.

PUBLIC WORKS for August, 1960

A Complete Line of Pedestrian Signals By ECONOLITE



CAT. 53430G1

..... NEON GRID

Long life neon and fluorescent grids illuminate glass lenses, which have weather-resisting ceramic backgrounds, to produce a brilliant, attention-attracting pedestrian message.

Light weight, rugged, corrosion and weather resistant Die-Cast Aluminum Housings; sharp, clear, legible messages; low power consumption; easily serviced from the front - economical, trouble free, dependable.



CAT. 53460G1



CAT. 53050G1

..... BENT TUBE

Bright, legible, well-defined messages are spelled out in "Neon" bent tube letters for efficient, economical indication with minimum current consumption.

All units available in a wide variety of messages. Neon grid and bent tube units supplied completely assembled with glass tubes ready for operation.



CAT. 53070G1



CAT. 53040G1

..... INCANDESCENT

Advanced mechanical design. Utilizes standard traffic signal housings and lamps to produce an improved, brilliant, clear message.

Write for further information



**ECONOLITE
CORPORATION**

Factory and General Offices
8900 Bellanca Avenue
Los Angeles 45, Calif.



CAT. 53040G5

At several locations in the city, we had traffic problems of a nature that a fixed-time traffic signal would not adequately solve. Fixed-time signals would give a green indication on a minor street even when there was no traffic on it. Consequently, this would hold up traffic unnecessarily on the major street.

Semi-actuated traffic signal controllers can do a better job at locations where traffic volumes fluctuate during certain hours, days and even seasons. Semi-actuated traffic signal controllers are considerably more expensive than a fixed-time controller. However, the additional cost

is offset in two or three months in savings to motorists.

Traffic Signal Work

All traffic signal lenses and reflectors were washed and polished. Over 2400 light bulbs were replaced with new bulbs. The traffic signal crew answered 515 calls to service traffic signals. Of this number, 203 were calls for bulb failure.

The pedestrians crossing Front Street at Market Street during the period of time allocated for the vehicular left turn created a traffic hazard. To control the pedestrians for a safe movement across Market

and Front Streets it became necessary to install "walk" and "don't walk" signals at this intersection. Also, the square signal head in the center of the intersection had to be removed and single face signal heads installed over each traffic lane.

The members of the Youngstown Society for the Blind on Glenwood Avenue were experiencing difficulty in crossing Glenwood Avenue when alighting and boarding the buses. In order to grant the blind persons the right-of-way for a safe crossing at Glenwood Avenue we installed a pedestrian actuated traffic signal mid-way between St. Louis Avenue and Pineview Avenue. Since the blind cannot see the color indication of the traffic signal and must rely on an audible sound, we installed a bell which informs the blind person when they have the right-of-way for a safe crossing of Glenwood Avenue. The cost of the equipment for this installation was paid for by the South Side Lions Club and the Youngstown Transit Company.

Establishing and maintaining detours around construction areas is another function of the traffic engineering department. At the present time, contractors are constructing regulator and overflow chambers for the interceptor sewer system. Many of these regulators and overflow chambers are located in the center of major streets. When the construction for the Arterial Highway begins, we will be faced with many detour problems.

It is impossible to mention all of the functions of the Traffic Engineering Department in this report, although it merits mentioning that all curb cut, pavement opening, parking lot and house moving permits were reviewed and investigated by this department, in addition to the thousands of complaints or requests for service received from citizens and councilmen.

• • •

Federal-Aid Highway Contracts

A total of 6,743 Federal-aid highway construction contracts was awarded through the various State highway departments during 1959, involving a total cost of approximately \$2.5 billion, are shown by figures compiled by the Bureau of Public Roads, U. S. Department of Commerce. The contracts had an average cost of about \$370,000. They varied in size from less than \$25,000 to about \$8 million, with an equitable distribution throughout the entire range.

the "Big Scottie"



CAB-CONTROLLED

TARCO'S double auger, body-type all purpose Spreader for Ice Control

The "Big Scottie" gives you these unique advantages: (1) the **double-auger spreading system** lets you apply more material per minute (salts, sand, cinders, or mixtures), (2) full-covering, heavy **top screen** is made in 4 hinged sections so 1 man can handle, (3) the special **body design** prevents your material from bridging over the augers.

You'll be able to cover more miles of winter-time icy pavement much faster. The "Big Scottie" is an ideal spreader for spreading straight de-icing salts . . . you can apply as little as $\frac{3}{4}$ of an ounce per square yard at 15 M.P.H.

The "Big Scottie" slips in or out of a dump truck body in 15 minutes; or mounts on a truck chassis in less than 30 minutes. Besides the exclusive features of the double-auger spreading system and the nonbridging body design (**no agitator needed**); the "Big Scottie" has all the regular features a good spreader should have: all welded steel construction; extra heavy, well protected roller chain drive (with **special lubrication system**) more than ample drive power (30 H.P.); large, sealed bearings; simple quick-acting width control; an easily read material application rate table for various materials at various truck speeds; stainless steel spreading disc.

See your nearest Tarco dealer or write us for more complete "Big Scottie" details.

TARRANT MFG. CO.

28 Jumel Place, Saratoga Springs, N. Y.

The LINE RIDER strikes again

(at weeds and brush, that is)

THE LINE RIDER AND HIS GANG of Diamond Chemical killers are deadly for weeds and brush along highways.

You'll want to meet them:

FOR MIXED BRUSH—LINE RIDER LV-3D/3T, a 2-Ethyl Hexyl Ester formulation of 2,4-D and 2,4,5-T containing 3 pounds each of acid equivalent per gallon.

FOR MAPLES AND OAKS—LINE RIDER LV-6T, a 2-Ethyl Hexyl Ester formulation of 2,4,5-T containing 6 pounds of acid equivalent per gallon.

FOR AREAS ADJACENT TO SENSITIVE CROPS—LINE RIDER AMINE 22, alkyl amine salt formulation of 2,4-D and 2,4,5-T containing 2 pounds each acid equivalent per gallon. Applied as a water-borne spray.

FOR SPECIAL CONDITIONS—LINE RIDER formulations, including Butyl and Low Volatile Esters of 2, 4-D and 2, 4, 5-T containing 4 pounds acid equivalent per gallon.

Send for new brochure giving details. Diamond Alkali Company, Union Commerce Bldg., Cleveland 14, Ohio.

 **Diamond
Chemicals**





Photos courtesy of American Concrete

● NEW LIGHTS add to safety and convenience of motorists on US Route 141. Standards are placed 4 to 12 ft. from curb.

HIGH-LEVEL LIGHTING for a Heavily Traveled Wisconsin Highway

WAYNE N. VOLK

Engineer of Traffic Services

Wisconsin State Highway Commission
Madison, Wisconsin

THE LIGHTING of a three mile section of Port Washington Road was placed in service during the winter of 1960. The section involved serves the rapidly-growing Milwaukee suburban area along the North Shore as well as the through traffic of US Route 141.

The engineering of the lighting for the Port Road contains innovations in both lighting and electrical circuitry. The total project, employing 281 self-contained mercury vapor luminaires, was installed at a total contract cost of \$155,061.50 by the Aldrich Electric Co. of Lake Forest, Ill. One-hundred and seventy-one 400-watt luminaires are installed on the main roadway section with a staggered spacing of 95 to 120 ft. to provide a minimum av-

erage foot-candle level of 0.8 at the time of relamping. On the ramps, 110 mercury vapor luminaires with self-contained ballasts and 250-watt lamps provide a minimum average illumination of 0.6 fc. Spacings of 65 to 90 ft. are employed to obtain this value of illumination and all luminaire supports are located on the inside of the curves. This departure from previous recommended practice was made in recognition of the fact that on short-radius curves the silhouette band is only slightly reduced from what would be obtained with outside locations. Further because of the relatively high level of lighting on the ramps, most seeing tasks are accomplished by direct discernment. The inside location has the distinct advantage of lessening the probability of impact between vehicle and support while drivers report that the lighting of the ramps gives the advance information needed to judge safe speed.

The innovation in electrical circuitry, featuring the use of a 480-

volt, two-wire circuit with bare neutral and one insulated conductor, is an important step in reduction of the first cost as well as of maintenance. Circuit continuity is protected by use of an in-line fuse at each luminaire.

Primary energy is purchased at four locations where service is available at either 4800 volts or 2200 volts. Pad-mounted transformers belonging to the Highway Commission furnish secondary power to the system at 480 volts. Group control of the lighting service is obtained from photoelectric controls.

Concrete standards for both ramp and main roadway sections are embedded directly in the ground, a design chosen in the belief that it would appreciably lessen the time and material required for installation. A secondary benefit from this type of construction was expected in the lower amount of skilled help required.

It is significant that this lighting project was undertaken after several years of unlighted operation. The Port Road is the fifth and largest lighting project undertaken by the Commission. While it is still too early to offer good statistical comparisons of before and after safety records, it is not too early to report favorable public reaction to the lighting of this section of highway.



COLOR ADDS A NEW DIMENSION FOR SAFER HIGHWAY MARKING

...Parlon keeps it bright

Colored traffic paint has been in use for several years as a special signal—for instance on the green crosswalks used in so many communities to protect school children and pedestrians. Here is an extension of that application, being used with notable success by an Eastern state on its most heavily travelled highways.

The use of color—a brilliant green approximating the grassy areas of island and median strip—provides a distinctive run-out area on the pavement before the vehicle comes in contact with curb or barrier. This is particularly effective where traffic-stream divergences, cross paths, and other unexpected pattern irregularities exist to confuse the high-speed motorist. The color areas advise the motor-

ist of the impending change, guide him to the correct lane markings, and give, where necessary, a safe haven for stopping before the curb is mounted.

In these new uses for color on street and highway surfaces, as in all conventional striping, laning, edge-marking, and stenciling applications, traffic paints made from Parlon® chlorinated rubber can be depended on for long life and for the fast dry that opens the roads to traffic sooner. Ask your regular paint supplier for the test data on Parlon that proves these values. Or, if you prefer, write for a showing of the motion picture "Highway Life Lines" which tells how the right paint can be safely and easily selected and specified.



Cellulose Products Department
HERCULES POWDER COMPANY

Wilmington 99, Delaware

Use of Mechanical Aids in PUBLIC LAND ACQUISITION

A paper before the American Right-of-Way Association Seminar by L. R. Schureman, Chief, Electronics Branch Division of Development, Office of Operations, Bureau of Public Roads, U. S. Department of Commerce, Washington, D. C.

ONCE it has been decided to construct or reconstruct a highway between designated terminal points and once governing geometric standards have been established, it is then necessary to determine the best location for the highway consistent with design criteria. This is normally done in four progressive, coordinated stages.

In the first stage, the "area reconnaissance", a comprehensive study is made of the area between the ter-

minal points to determine feasible route bands or corridors. The entire area is examined and a number of alternative corridors which appear to justify further study are selected.

In the second stage, the "route comparison", each of these corridors, normally covering a strip of terrain a mile or more in width, is studied thoroughly to determine the best of the several alternatives. The selection is based primarily on topographic characteristics and right-of-way requirements with respect to land use, price level and local area development objectives.

In the third stage, the "preliminary survey", the actual alinement of the highway within the selected corridor is designed and the con-

struction plans are prepared. The various alternatives are compared with respect to all pertinent factors. These include topography, soil and ground conditions, drainage and structure requirements, length and grades, land use, the effect on properties traversed and estimated construction and right-of-way costs including residual damages.

In the fourth stage, the "location survey," the centerline, right-of-way and structures are staked on the ground in readiness for construction.

It is apparent that the combined efforts of the engineering and right-of-way forces are necessary to achieve the most economical highway location within the governing engineering and traffic service criteria for the project. In many instances, right-of-way considerations predominate in order to avoid proximity to churches, schools and cemeteries; to avoid taking high-cost land, making costly or undesirable severances and relocating or razing of buildings; and to minimize the possibility of costly litigation.

Aerial Photography

Aerial photography provides complete detailed information from which the data required for loca-



all clear!
FRINK SNO-PLOW'S Been Here

From highways to airports, there's a FRINK Sno-Plow for every job. Wherever you see a well-cleared area, chances are a FRINK Sno-Plow did the work — quickly, efficiently, economically. When it comes to the important matter of purchasing snow removal equipment, maintenance departments just naturally "think of FRINK."

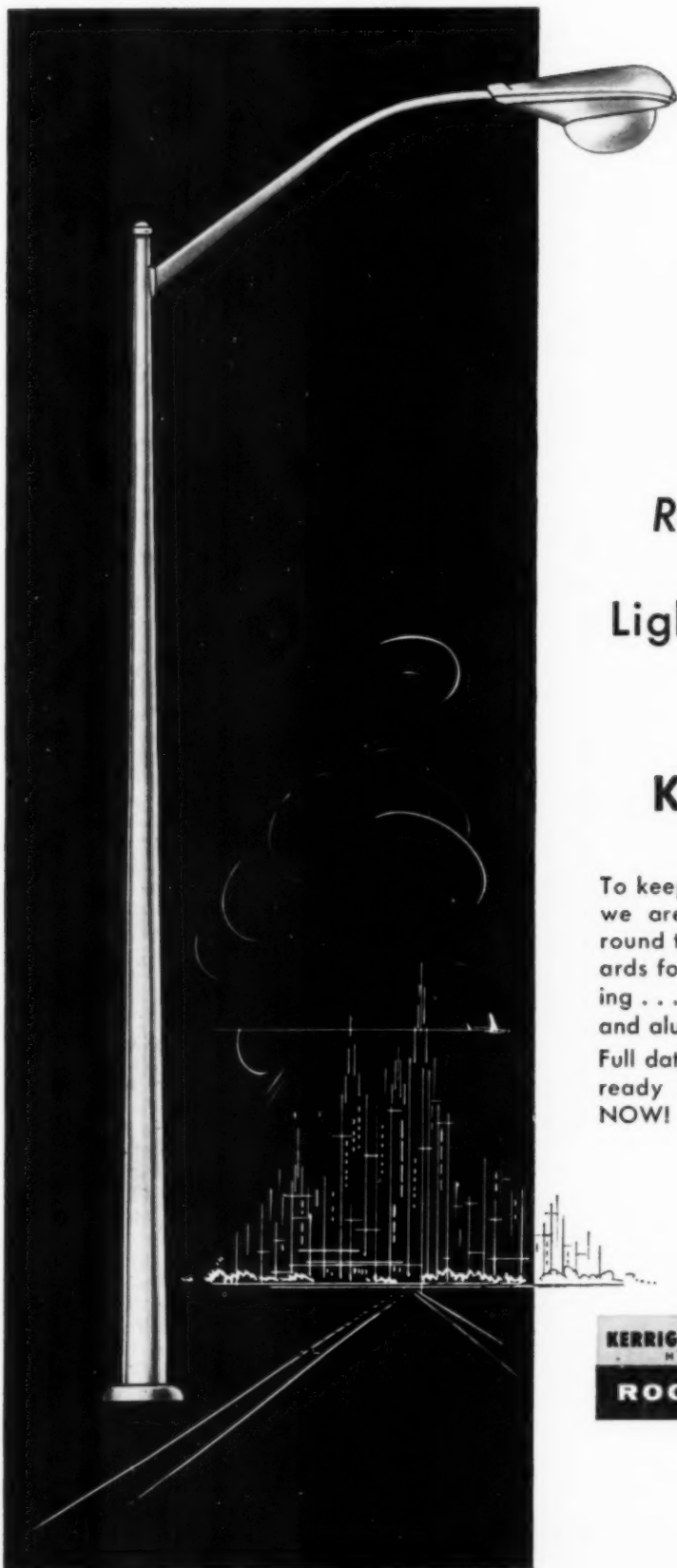
FRINK Sno-Plows are made in many models—from utility Trip-Blades to mammoth V-Types suitable for 12-ton trucks. Get all the details—write now for a free illustrated catalog.

FRINK SNO-PLOWS INC.

Clayton, 1000 Islands, N. Y.

In Canada:
Eastern Steel Products, Ltd.
Preston, Ontario

• V-Type • Roll-Over • One-Way • Reversible Trip • Leveling Wings



NOW

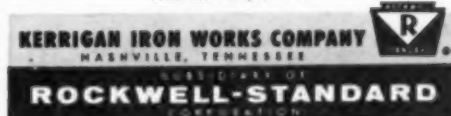
Seamless Round Tapered Aluminum Lighting Standards

by
KERRIGAN

To keep pace with the growing market, we are now manufacturing seamless round tapered aluminum lighting standards for street, highway and area lighting in addition to our line of steel and aluminum octagonal shafts.

Full data catalog for the new line will be ready soon, Reserve your FREE copy NOW!

Address: Dep't. P-8,



tion and design, both qualitative and quantitative, can be obtained in a minimum of time, and without making extensive ground surveys.

The same photography also serves as a valuable aid in other work of the right-of-way division. Used either singly or assembled in a mosaic, the photographs provide qualitative information on land use, vegetation, existing roads, streams, buildings and other structures, utilities, section lines, property lines and other data necessary in land acquisition operations.

The centerline of the proposed highway together with property

lines and right-of-way lines can be delineated on an aerial photographic mosaic with sufficient accuracy to present a true picture of the proposed development in relation to the properties traversed. If desired, other information can also be shown on the mosaic including section corners and numbers; town, city and village names and boundaries; the names of streams, rivers and lakes; highway route numbers; etc. It can then be photographed and any number of prints produced at low cost for use in appraising and negotiating. It can also be used to good advantage in condemnation cases in

showing the court the property to be taken in its relationship to the entire property and to the proposed improvement.

If a mosaic of this kind is prepared and reproduced at the time the alinement and taking lines are approved, title search and appraisal can begin at an early date even though some adjustments may become necessary later.

Large scale enlargements of single photographic prints serve a similar purpose particularly for property takings in built-up areas. They also provide factual supporting data in appraisal reports and serve as permanent file records for reference at any future time.

Aerial photographs in stereoscopic pairs provide a three dimensional view of the area covered from which quantitative as well as qualitative data can be obtained. Using a simple stereoscope, the appraiser can examine the property involved in detail before actually visiting the site. With the depth perception provided in stereoscopic viewing, he can better analyze the property to be taken in relation to the remainder, and determine the extent to which buildings and grounds, drainage, culture, access, etc., will be affected. With advanced knowledge in such detail the appraiser is in a position to know precisely on what to concentrate his attention when he visits the property and talks with the owner.

A more recent development in aerial photography is the continuous strip photograph. This is a continuous vertical aerial photograph obtained by using a shutterless camera with the rate of film movement synchronized with the ground speed of the airplane. Photography of this kind is beginning to be used in preparation of large scale strip maps in which the centerline and right-of-way lines of the proposed project together with property lines and lot numbers or owners' names are super-imposed on a photographic background in lieu of a planimetric map. This method is relatively fast and inexpensive, and is especially useful in urban areas.

A new use of continuous strip photography which is now in development, is also of interest. This involves the use of an aerial type shutterless camera mounted on a telescoping mast fastened to the front end of a panel truck. The camera, which has its axis in a horizontal position, takes a continuous strip photograph of the buildings bordering the road at a speed of about thirty miles an hour. This may be a very useful de-

OUTSTANDING RESULTS WITH WHITING'S *Prostran*



John Kiley, President of Atlantic Broom Company, Readville, Mass., with two new Prostran brooms, fresh off the production line. Note the full body and uniformity of the brooms, with bristles set close together, and so stiff that they easily support the weight of the heavy broom core without sagging. Courtesy Hercules Powder Co.

PROSTRAN-POLYPROPYLENE OFFERS ADVANTAGES SUPERIOR TO ANY NATURAL OR SYNTHETIC BROOM MATERIAL!

- Reduced Cost Per Sweeping Mile
- Longer Lasting Use-Life
- Excellent Sweeping Efficiency
- Minimum "Down-Time" For Repeated Broom Filling
- Toughness and Superior Abrasive Action
- Excellent Flex-Life for Ideal Bend Recovery
- Excellent Resistance To Chemicals, Solvents, Greases, Oils and Many Common Acids
- Heavy Duty Efficiency And Clean Sweeping
- Top Performance Under All Weather Conditions

Distributed In New England States by Atlantic Broom Co., Readville, Mass.
Or Contact Us For Nearest Distribution Point To You

PHONE

Burlington, Vt.

UNiversity 4-7414



E.B. & A.C.
WHITING
COMPANY
Burlington, Vermont

vice in land acquisition for projects involving the widening or realignment of existing roads bordered by residences or commercial establishments.

Still another application of aerial photography useful in land acquisition is an artist's rendering of the completed improvement superimposed on an aerial photograph. This device, frequently used in public hearings, is also a valuable aid in negotiating with property owners and in condemnation cases.

Photogrammetry

While aerial photographs provide complete qualitative information, they are perspective views and by themselves do not provide the precise quantitative information needed in highway location and design, in the preparation of construction plans and in land acquisition.

Medium and large scale topographic or planimetric maps are used for this kind of information. More and more, such maps are being prepared photogrammetrically, that is, from aerial photographs using precise stereoscopic plotting instruments by means of which a dimensionally accurate orthographic projection can be compiled from the aerial perspective.

This is the type of map used in determining the final alignment and in the detailed design of the highway, mentioned previously as the third stage in the highway location and design process. With line and grade established, the limits of cut and fill can be determined and plotted on the map, right-of-way lines can be laid out, and ties to control points can be computed for use in staking the centerline and right-of-way lines on the ground. With precise control surveys and with key property corners marked for photographic identification, right-of-way takings may be accurately calculated, descriptions compiled and plats prepared. The centerline, right-of-way lines and property lines may be transferred to a photographic mosaic, as mentioned previously, so that title search and appraisal can begin while the detailed design and construction plans are in process of development.

Since the centerline as well as the right-of-way lines are mathematically computed as a part of the alignment design, they need not be staked on the ground prior to the letting of the contract for construction. If it is necessary to stake portions of the right-of-way line during negotiations with property owners,

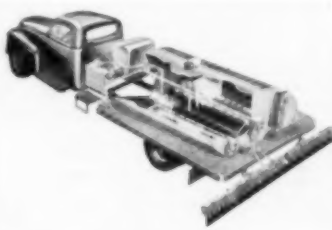
(Please turn to page 156)

Out of fumes' way!



with a Seaman-Gunnison distributor

Front-end control puts the Seaman-Gunnison operator where the air is pure and visibility unobstructed. He doesn't breathe in dangerous, noxious fumes, dust and dirt. He has a clear view of his work . . . can see where he's been and going . . . has instant communication with the truck driver. With engine mounted in front and burners in the rear, fire hazard is minimized. Vital working parts are kept clear of dirt and spray mist, reducing maintenance. Front mounting of pump and engine also gives greater stability, allowing faster, safer round trips on tank refills.



◀ No Burning...

Seaman-Gunnison's new principle of tank circulation prevents overheating, burning and "hot spots." The material is continuously flushed over the combustion area of the heater flues, maintaining uniform temperatures throughout the entire contents of the tank. Coke formation and subsequent nozzle clogging are virtually eliminated.

No Nozzle Drip ▶

Air-actuated controls open and close nozzles instantly without drip or dribble. During operation, rate of flow remains constant regardless of viscosity. Seaman-Gunnison distributors are available in truck-mounted models with capacities from 800 to 2,000 gallons and trailer-mounted models from 1,500 to 5,000 gallons.



Write for Free informative bulletins!



P. O. Box 3025, Milwaukee 18, Wis.
Tel.: SUNset 1-8900

- Duo-Factors
- Bituminous Distributors
- Tri-Factor
- Street Flushers
- Impactor
- Utility 6-yd Scraper



This 146' Republic Sectional Plate Pipe-Arch was ... ASSEMBLED IN FOUR DAYS! INSTALLED IN 2½ HOURS!

A six-man crew completely assembled this 146' sectional plate pipe-arch in four days. Installation required just 2½ hours. Results: big savings in time and money, earlier project completion, minimum construction traffic tie-ups.

This job report from Fond du Lac, Wisconsin, is typical of Republic Sectional Plate Pipe-Arch performance. Engineered and fabricated at the factory, Republic drainage structures are delivered to you ready for assembly.

Simplified design eliminates the need for highly skilled labor or complex equipment. Other Republic fast-assembly features include: sections of optimum sizes for easy handling and erection, specially designed bolt that may be tightened from one side only.

For additional information on Republic Sectional Plate Pipe-Arch and other problem-solving drainage products, simply contact the Republic Sectional Plate Distributor nearest you (see list at left), or mail coupon.

Distributors of Republic Sectional Plate

Bark River Culvert & Equipment Co.
Escanaba, Mich.

Beall Pipe & Tank Corporation

Portland, Ore. • Boise, Idaho

Blugrass Pipe & Culvert Co.

Louisville, Kentucky

The Boardman Co.

Oklahoma City, Okla. • Tulsa, Okla.

Caroline Culvert & Metal Div.

Florida Steel Corp.

Statesville, N. C.

Central Culvert Corporation

Alexandria, La.

Checlaw, Inc.

Memphis, Tenn. • Birmingham, Ala.

Dominion Culvert & Metal Corp.

Roanoke, Va.

Eaton Metal Products Corp.

Omaha, Neb. • Hutchinson, Kan.

Eaton Metal Products Company

Billings, Mont.

Empire State Culvert Corp.

Groton, N. Y.

Garland Steel Co.

Phoenix, Ariz.

Illinois Corrugated Culvert Co.

Bushnell, Ill.

Jansen Bridge & Supply Company

Sandusky, Mich.

H. V. Johnston Culvert Co.

Minneapolis, Minn. • Aberdeen, S. D.

Logansport Metal Culvert Co.

Logansport, Ind.

M & M Hiway Materials Co.

Columbia, Mo.

North Dakota Metal Culvert Co.

Fargo, N. D.

Northeastern Culvert Corp.

Westminster Station, Vermont

Pacific Corrugated Culvert Co.

Sacramento, Calif.

Temple City, Calif.

The Pedlar People, Ltd.

Oshawa, Ont.

Republic Steel Corporation

Culvert Division

Canton, Ohio • Harrisburg, Pa.

Charlotte, N. C. • Hammond, Ind.

Spokane Culvert & Fabricating Co.

Spokane, Wash.

Thompson Pipe & Steel Company

Denver, Colo.

Tri-State Culvert & Mfg. Div.

Florida Steel Corp.

Tampa, Fla. • Decatur, Ga.

Utah Culvert Company

Ogden, Utah

Wisconsin Culvert Company

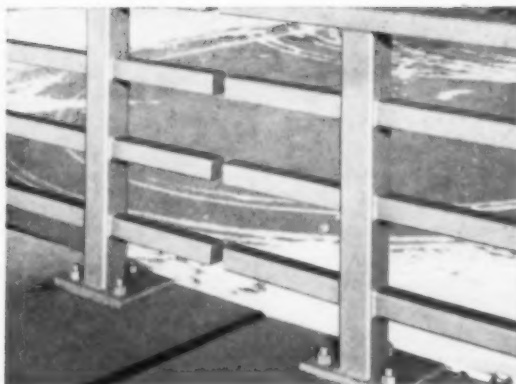
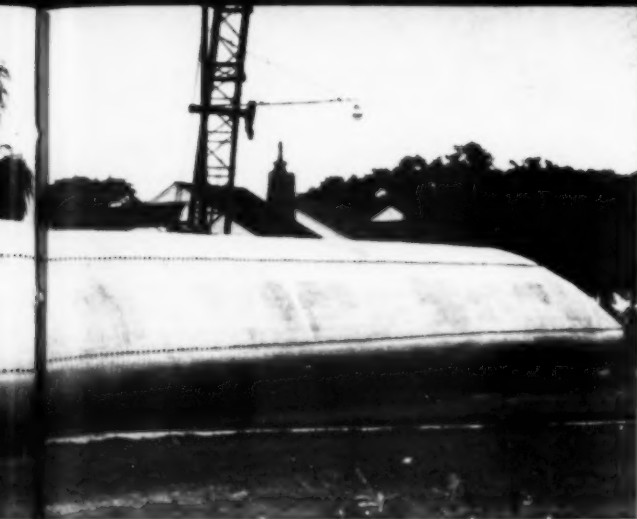
Madison, Wis.

Wyatt Metal & Boiler Works

Dallas, Tex. • Houston, Tex.

EASY PLACEMENT. After assembly on the shoulder of the highway, the 22-ton structure was lifted by cranes into the excavation. Total placement time—2½ hours. The pipe-arch, which replaced a concrete bridge on East Johnson St., Fond du Lac, Wisconsin, was made of 8-gage corrugated sectional plate and measured 10'11" wide by 7'7" high.





REPUBLIC SQUARE AND RECTANGULAR TUBING for columns, beams, railings, mullions. Square tubing is offered in sizes up to 5 inches a side; rectangular tubing in peripheries up to 20 inches; up to .250 inch wall. Highly functional, Republic square and rectangular tubular components add a pleasing contemporary appearance. Mail coupon for more information.



REPUBLIC PLASTIC PIPE IN AIR CONDITIONING—2", 1½", and 1" Republic SRK (Semi-Rigid Plastic Pipe) was selected for condensate return lines on 652 American Blower Fan Coil units that were recently installed in a Cleveland, Ohio, hotel. According to Becker-Seidel-Clark, plumbing contractors, plastic pipe was specified because it could be installed several times faster in a job of this type. Return coupon for details.



REPUBLIC HOOK-ANCHOR-FOUNDATION BOLTS for fast, dependable fastening in highway and building construction. Wide range of types and sizes to meet specific job requirements. Dimensions from ½" by 6" (over-all length) to ½" by 18" (over-all length). Available fully assembled or non-assembled from stock. Mail coupon.



REPUBLIC STEEL

*World's Widest Range
of Standard Steels and Steel Products*

REPUBLIC STEEL CORPORATION
DEPT. PK-8960-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send information on:

- ☐ Sectional Plate Pipe and Pipe-Arch
☐ Bolt and Nut Products
☐ Architectural Tubing ☐ SRK Plastic Pipe

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

BANOX[®]

... low-cost protection against salt-slush corrosion



Rock salt for snow and ice control on roads and streets is both effective and inexpensive. But its corrosive action can turn minor scratches into costly scars. Every metal surface is a prospective victim—cars, trucks, bridges and other public structures and equipment.

Banox provides the easy, low-cost answer to this problem, for Banox, mixed with salt, effectively inhibits harmful salt brine corrosion.

Remember these facts about new formula BANOX:

- **BANOX IS EFFECTIVE:** This has been proved in action by the many communities who have used Banox for years, as well as by extensive laboratory tests.

BANOX IS INEXPENSIVE: Only one pound is needed with each 100 pounds of salt. Although cost will vary, it averages only a few cents per capita per year.

BANOX IS EASY TO USE: No special mixing is needed. Normal traffic movement distributes it evenly along roads and streets.

Find out more about safe, effective Banox. Write for your copy of the Banox booklet. Make winter driving in your city corrosion-free, and complaint-free!

CALGON COMPANY
HAGAN CENTER, PITTSBURGH 30, PA.



DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC.

small segments can be staked independently without having to run any appreciable length of centerline. Furthermore, since the alinement finally established on the photogrammetric map is the alinement to be used, line changes for engineering purposes are eliminated except in rare cases. Also eliminated is the need to clear and survey alternate lines in the field. No lines need to be staked on the ground for design purposes. Only one final location line need be staked and this can be done after right-of-way negotiations are well advanced or in some cases, entirely completed. These advantages reduce to a minimum the disturbance of property owners and the resulting impairment of good will which could seriously delay or obstruct successful negotiation.

The Electronic Computer

In the highway location and design process, the computer is used to compute and adjust control traverses and to compute horizontal and vertical alinement, earthwork quantities for comparing alternate alinements in the preliminary survey stage and earthwork quantities for the final alinement and design. In the process of computing earthwork for the final alinement and design, the computer also produces distances from the centerline to the top of slope in cut or the toe of slope in fill at each station. These distances from centerline define the limits of construction without the necessity of plotting cross sections, and serve as the basis for laying out right-of-way lines.

The computer is also used in the computation of areas and of metes and bounds for right-of-way parcels. For any specific project, the computer can proceed from the first parcel through to the last parcel in a continuous operation producing the area in acres and the lengths and bearings of all courses for each parcel individually for use in preparing right-of-way descriptions. Common sides of adjoining parcels are treated as coincident lines as the computation proceeds so that the metes and bounds are compatible throughout. Curved as well as straight courses can be handled. On an intermediate size computer, the computation is done at a rate of about four to five minutes of computer time per mile for an average project.

Associated Equipment

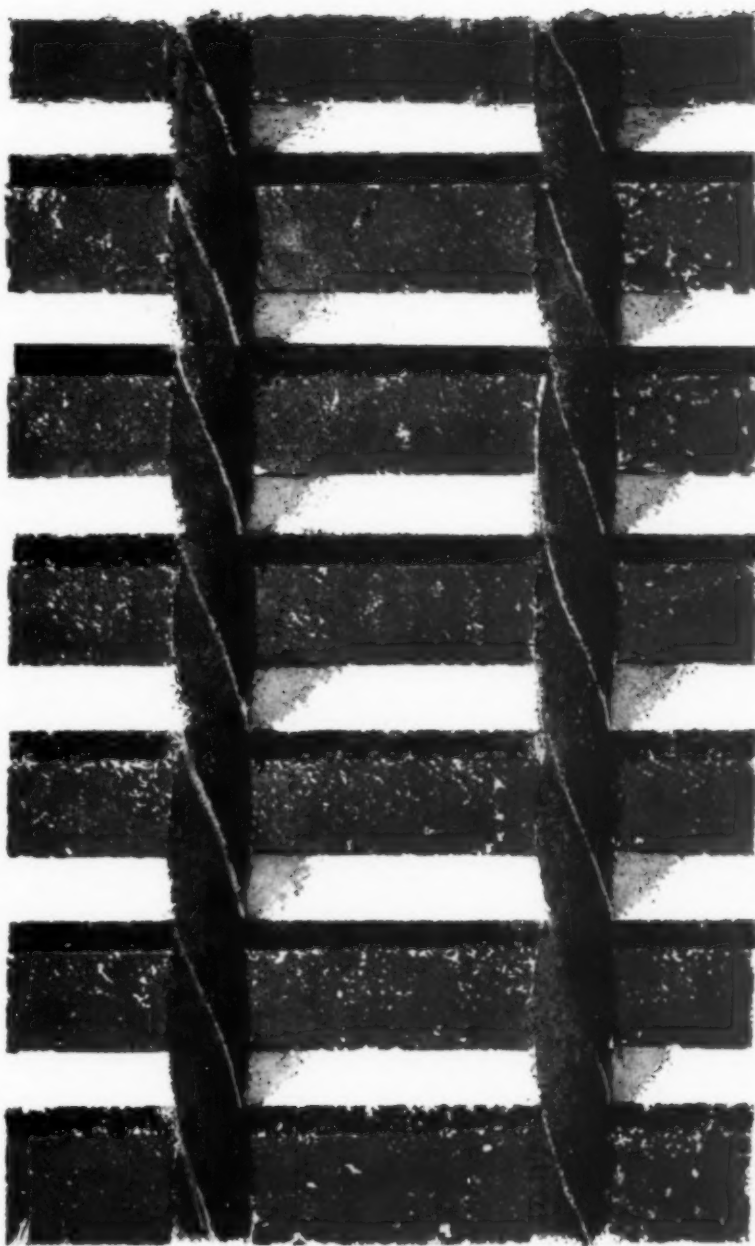
Not all record keeping or information processing warrants the use of costly electronic computers. For

PUBLIC WORKS for August, 1960

studies in which the volume of data is relatively small and where revisions in the records are not numerous and frequent, conventional punched card equipment may be entirely adequate. Such equipment is being used in a number of States in connection with maintaining status records of right-of-way acquisition, cost records, property records, etc.

In this connection, a variation of the conventional punched card has been developed in which an aperture is provided for the insertion of a 35 millimeter microfilm frame about twenty card columns wide. The remaining columns are available for punching data. The cards can be filed, sorted, selected and tabulated in the usual way. The material on the microfilm can be read in a viewer, projected on a screen, or enlarged to normal size and reproduced. These cards are used extensively in the Department of Defense and in industry for file records of engineering drawings and other data. This device would seem to be well adapted for record files of right-of-way takings, utilizing the microfilm for the property plat and the punching for index and control data. In this way, a continuing inventory of right-of-way holdings could be maintained in a small space and in a form which could easily be kept up to date as new acquisitions were made or excess sold.

Another mechanical aid which has application to land acquisition operations is the electronic line plotter. This device accepts point coordinate data recorded on punched cards or punched tape and produces accurate line drawings automatically at a speed many times faster than can be achieved manually. By using the plotter in conjunction with the electronic computer a high degree of mechanization in the production of right-of-way plats can be developed. The computer procedure previously described for computing metes and bounds can be arranged to produce also coordinates of the corners of each right-of-way parcel and the coordinates of points at which property lines intersect the centerline of the project. The output from the computer in the form of punched cards or punched tape is then fed into the line plotter which automatically draws each parcel in ink and to scale, one after the other in a continuous operation, using either a continuous roll of paper or cut sheets. Scale and line weight are adjustable. Verbal and numerical data can be added by typewriter and the complete drawing can be reproduced in the usual way.

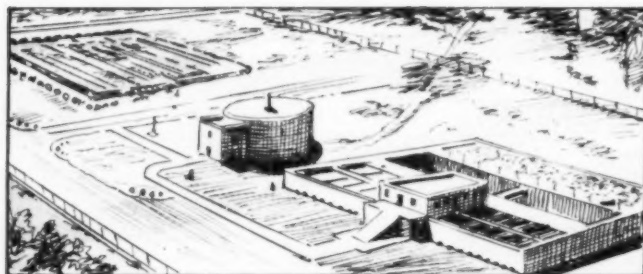


Blaw-Knox Electroforged Grating
solves so many problems for so
many industries. Catalog free on request. Write

Blaw-Knox Equipment Division, Pittsburgh 38, Pennsylvania.

BLAW-KNOX
GRATING

THE SEWERAGE AND REFUSE DIGEST



Prepared by **ALVIN R. JACOBSON, Ph.D.**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Small-Town Refuse Handling

Community size should be no deterrent to the adoption of an efficient and economical refuse collection and disposal program. Stratford, Oklahoma's refuse handling program, although curtailed at present by an unsolved social and financial problem, definitely showed that:

- 1) A community of 1,200 or less people can, from a mechanical and engineering standpoint, have an effective and economical sanitary refuse collection and disposal system;
- 2) county and federal cooperation is not restricted to the larger cities.

A monthly charge of \$1 for each residence and an average of \$3 for business places made it necessary to develop equipment and procedures that could be efficiently and economically operated by one man to provide good service in a small community. The equipment consisted of a prime mover, used for both collection and disposal and a specially designed trailer which was pulled by the tractor and served as the collection vehicle. The rubber-tired tractor was equipped with a hydraulically operated, nine-cubic-foot front-end loader and a fast-operating rear-end hitch. The trailer serving as the collection vehicle was made of a circular tank mounted on a four-wheel tandem trailer and equipped with a hydraulic hoist for dumping. At the landfill disposal site, the operator dumped the load onto the working face, substituted the weight assembly for the trailer, and spread the material evenly over the working face and compacted it. The quick-operating rear-end hitch made the interchange of equipment very rapid and the entire operation at the fill site took from ten to fifteen minutes. All refuse was more thoroughly compacted at the end of the day. Collection is provided twice

weekly in the residential areas and daily in the business district. A competent operator is most important in this one-man operation for both collection and disposal.

"Small-Town Refuse Handling." By Reuel H. Waldrop, Technical Consultant, Communicable Disease Center, U. S. Dept. of Health, Education and Welfare, Public Health Service, Oklahoma City, Oklahoma. *The American City*, June, 1960.

Sewer Outfalls

Many coastal communities discharge their sewage into bays, harbors, tidal rivers or the open ocean. This article is confined to a discussion of disposal of sewage into the ocean by outfall sewers. Some of the older outfalls discharge raw sewage subjected only to screening; at others chlorination is required

Fort Worth Buys Giant Refuse Collection Unit

THE CITY of Fort Worth has put into operation a giant, closed garbage collection trailer which keeps in odors and liquids and holds as much refuse as six to eight open-top trucks.

Because of its size and increased packing pressure the 35-cubic-yard body has a capacity of 11 tons of compressed refuse, and requires only one trip to the dump at day's end. The trailer is a product of the Hyd-Pak Division of Hobbs Trailers of Fort Worth, which also makes four sizes of the smaller Hobbs Hyd-Pak

at its nearby Cleburne, Texas, plant.

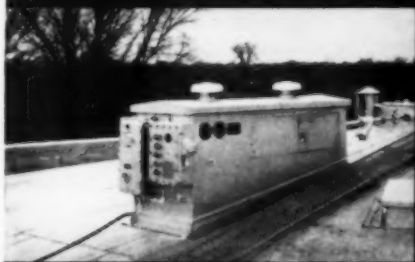
W. A. Satterwhite Jr., assistant director of the Fort Worth public works department, says the new, high-capacity unit now is handling a residential route formerly serviced by two trucks with a crew of three men each. A driver and four helpers will cover the same route with the new equipment because of the elimination of trips to the dump site. The new unit frees one man and one truck for work in another sector, further helping Fort Worth in its sanitation and health programs.



● 35-YARD refuse unit frees one man and one collection truck for use elsewhere.

SOUNDLY ENGINEERED

P.F.T. Pearth Gas Recirculation System.
Increases rate of digestion
and eliminates scum accumulations.



P.F.T. Removable Plate Diffusers.
Photo shows plate diffusers
in raised position in aeration tanks.
Dewatering of tanks not
necessary for servicing diffusers.



P.F.T. Floating Cover Digesters
for the ultimate in flexibility
and digestion process control.
Available in all sizes.



P.F.T. Rotary Distributors
featuring P.F.T. Spreader Jets
provide uniform distribution.



P.F.T. Digester Heaters are
available using sludge gas as the
principal fuel. Burners are
adaptable to use either natural gas,
manufactured gas or oil
as an auxiliary fuel.



waste treatment equipment exclusively since 1893

PACIFIC FLUSH TANK CO.

4241 RAVENSWOOD AVENUE, CHICAGO 13, ILLINOIS

PORT CHESTER, N.Y. • SAN MATEO, CALIF. • CHARLOTTE, N.C. • JACKSONVILLE • DENVER

PUBLIC WORKS for August, 1960

159

from May to October; and in some primary treatment may be required. Investigation of existing installations usually reveals frequent complaints as follows: 1) Failure of the pipe or conduit for one reason or other; 2) overflows at shore line because of accumulation of solids, grease or scale in the pipe line; 3) floating objects attributable to sewage discharge; 4) unsatisfactory dispersion of sewage resulting in high bacterial count; 5) deposition of sewage solids on shellfish flats; 6) large sewage field of unsightly grease or oil slicks. The objective of design for ocean disposal is based on the selection of the degree of treatment, location of outfall, and design of outlet structure which will, at least cost, provide for the satisfactory disposal of sewage into sea water. Another factor to be considered is the provision of emergency bypasses in the event of power failure, major equipment breakdown or obstruction in a pipe line. The author also includes a brief discussion of factors to be considered in the construction and maintenance of outfall sewer pipes.

"Design, Construction, and Operation of Sewer Outfalls in Estuarine and Tidal Waters." By Frank L. Heaney, Senior Engineer, Fay,

Spofford & Thorndike, Inc., Boston, Mass. *Journal Water Pollution Control Federation*, June, 1960.

Israel's Sewage Treatment Plant

Haifa is a city located in a semi-arid area along the Eastern Mediterranean seaboard of the new State of Israel. Most of its agriculture is based on irrigation permitting no "waste water" to be wasted. While the use of sewage effluent is a hoped-for ideal in the United States, in the new state of Israel it is a stark reality. A master plan has been formulated consisting essentially of the following parts: 1) Western interceptor draining the western slopes of Mt. Carmel; 2) Western pumping station lifting the sewage for about 40 ft. to the upper point of the main interceptor; 3) the main interceptor; 4) A net of pumping stations and force mains for the sewage from the northern and eastern suburbs of Haifa; 5) The treatment plant. The plant will be built in two stages, the first stage for a population of 225,000 and then for a population of 450,000 by 1990. The plant will serve the city of Haifa and six neighboring local communities, forming one sewage district. The capacity of the plant is

based on a sewage flow of 34 gpcd, the sewage being quite concentrated, with a suspended solids average of about 600 ppm and a 5-day BOD of about 700 ppm. The treatment plant is expected to provide 90% removal by means of two-stage, high-rate biofiltration. The method of financing will be based on sewer rental charges, with some modifications. In addition, the treatment plant effluent and other by products will be sold to prevent waste in this water-short nation.

"Modern High-Rate Filters for Ancient Haifa, Israel." By A. Erlich, Sanitary Engineer, Haifa, Israel. *Wastes Engineering*, June, 1960.

Sewage Lagoons In Alaska

Investigations by members of the Arctic Health Research Center have shown that sewage lagoons are practicable and operational even under the extreme climatic conditions that may be found in Fort Yukon, Alaska. An inexpensive means of treating domestic wastes is essential in this new state with its 160,000 residents scattered over an area of 586,000 square miles. The factors of sufficient importance to be considered in the design of any sewage lagoons are: 1) The amount of light

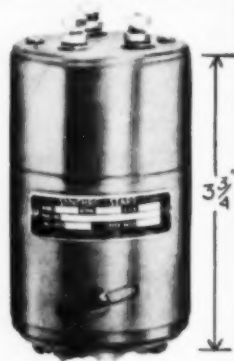
SYNCHRO-START SPEED SENSITIVE SWITCHES

An extensive line of speed sensitive switches, with variable mountings and drives are available to suit the needs of modern equipment. One or more snap switches contained in any single unit can be furnished to trip at any given speed with an adjustable range for each switch.

Available drives

- GH . . . Built to S.A.E. tachometer specifications.
- GS . . . For mounting in a distributor well take-off.
- GA . . . Standard specification pad AND20005.
- GW . . . General Motors standard for blower accessory drive.
- GO . . . Direct mounting for tachometer take-off.
- GY . . . Two bolt flange mounting.

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVE., SKOKIE, ILL.



Switch Container Dimensions

WATER MEASUREMENT

... accurate
easy to read

PARSHALL MEASURING FLUME

For open channels in industrial plants, waterworks, irrigation systems and sewage disposal plants. Galvanized steel.



- Self-cleaning
- Easy to read
- Low head loss
- Throat widths: 3" to 10'

AUTOMATIC CONTROL GATES

Regulate flow and water levels regardless of water supply variation. Ends need for 24-hour supervision . . . prevents waste, flood damage and overflow. No floats, sheaves, motors or cables.



WELL CASING Scientifically designed for all soil conditions. Made of mild, stainless and alloy steels for long life and low initial cost. Five perforations and four field joints for fast assembly. Write for free literature.

TPO-1

**THOMPSON
PIPE & STEEL COMPANY**

3025 Larimer Street • TAbor 5-1241 • Denver 1, Colorado

available; 2) temperature; 3) wind; 4) evaporation, precipitation, and seepage; 5) area and loading; 6) depth; 7) shape; 8) proximity to habitation; 9) soil characteristics; 10) type of inlet and outlet devices; 11) public health implications, such as mosquito propagation and proximity to underground water supplies; and 12) a properly identified enclosure. The conditions of the three lagoons in service in Alaska are described in detail. The treatment process is still in an experimental stage and the investigative work is far from complete. From the data obtained so far no attempt has been made to formulate design criteria for operation under arctic or subarctic environments.

"Eskimo" Algae Make Lagoons Work at the Arctic Circle." By J. A. Anderegg, Chief; C. F. Watters, Sr. Assist. San. Engineer; D. Hilliard, Aquatic Biologist; and H. F. Myers, Chemist; all of the Environmental Sanitation Service, Arctic Health Research Center, U. S. Public Health Service, Anchorage, Alaska. *Wastes Engineering*, June, 1960.

Sanitary Engineering Research

A group of eleven articles entitled "Selected Reports on Sanitary Engineering Research" forms a special section in the July issue of *PUBLIC WORKS*. The following are brief digests of each one:

1) "Research Institutes — Past, Present and Future." By George A. Herbert, President, Research Triangle Institute, Durham, North Carolina. Research was given a tremendous impetus during World War II when national survival demanded it. Since then the federal government, universities, industrial corporations, and research institutes have carried on scientific and engineering studies over a wide range of activities varying from pure, fundamental research to engineering and testing. A trend has been the organization and development of the non-profit, public service, research institutes. The nine of this type organized prior to World War II are engaged in research activities representing annual expenditures in excess of \$125,000,000 and employ more than 10,000 staff members. Recently there has been the birth of a new type of research organization: the university-oriented, non-profit research institute of which the Research Triangle Institute of North Carolina is an example. The range of the research interests and capabilities of these various institutes is evidenced from their an-



Back in the era of bustles and high-button shoes, certain classes of "joints" were viewed by some as objects of scorn or derision. They even took steps to eliminate this condition of the times through the customary process of law.

Now, decades later, a completely new type of "joint" has appeared on the scene... no swinging doors on this one, either. It's KAUL Presto-SEAL, the *vitrified clay pipe that joints like magic*. And—it's gaining in popularity and certified approval by public works departments, engineers and contractors everywhere... by men who recognize the importance of fast pipe assembly, tight, permanent joints, assured resistance to root penetration and absolute shear load resistance. KAUL Presto-SEAL pipe features a new factory-molded-polyester compression joint with a high-quality rubber gasket permanently imbedded in the socket **where it belongs**. This revolutionary development has made Presto-SEAL a standard of quality on installations with rigid infiltration-exfiltration requirements. It's your absolute assurance of leak-proof, root-proof and corrosive-resistant lines that last forever.

Manufactured to A.S.T.M. Specifications, Presto-SEAL is available in a complete range of pipe sizes from 4" to 36" diameter, with matching fittings. **That's right, one joint for all sizes of pipe!**

So, don't wait for an Act of Congress to make known your wants, like the folks of yesteryear did. Write today for facts that prove Presto-SEAL pipe by KAUL is best by test for all industrial waste and domestic sewer jobs.

*T.M. Reg.



clay company

TORONTO, OHIO • U. S. A.

"Exclusive manufacturer of Presto-SEAL pipe that joints like magic"

nual reports, covering all phases of the environment.

2). "Occurrence and Behavior of Natural and Radioactive Strontium in Water." By M. W. Skougstad and F. B. Barker, Research Chemists, U. S. Geological Survey, Water Resources Division, Denver, Colorado. A survey of the occurrence of radioactive strontium in surface and ground waters throughout the United States is being conducted by the U. S. Geological Survey. On the basis of analyses already completed, the rivers contain concentrations varying from several tenths to more than one mg/L. Ground water sup-

plies show a greater range of strontium content, varying from a few hundredths to 52 mg L. The ion-exchange properties of certain natural minerals and radio-nuclides, including strontium-90, are being investigated to determine their effect on the dispersal of radioactive substances in the environment.

3). "Research in Water Supply Prediction." By Edward H. Wiser, Dept. of Agricultural Engineering, N. C. State College. Increased demand for water by municipalities, industries and irrigation requires more satisfactory information concerning present and potential sup-

plies. Extensive stream gaging and precipitation stations gather considerable data useful in predicting available water supply. Digital computers have proved extremely useful in reducing the burden of statistical analysis of the available data.

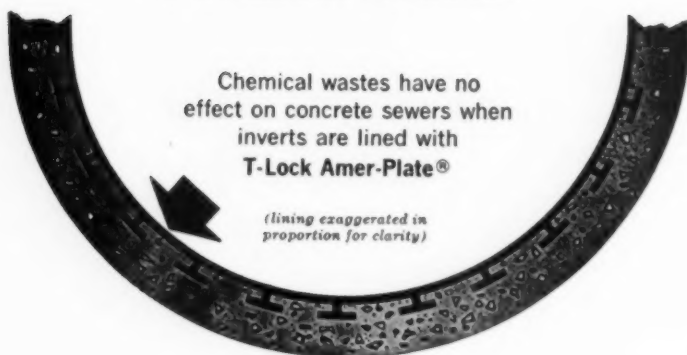
4). "Corrosion Control in Potable Water Systems." By Rolf Eliassen, Professor of Sanitary Engineering, and Rolf T. Skrinde, Research Assistant, Massachusetts Institute of Technology.—Results of laboratory studies indicate that a respirometer can be used to obtain accurate data on corrosion control. In addition these results point to the greatly increased corrosion control obtained with silicates over that with caustic soda, or pH control alone.

5). "Sodium Chloride Uptake by Algae." By Gilbert V. Levin, Sanitary Engineer, Resources Research, Inc., Washington, D. C. Results of a preliminary study indicate that several fresh water and marine algae were found to concentrate sodium chloride in sea and brackish waters but these did not occur in waters of sufficient salinity to be of practical significance. The possibility occurs that other species of algae may increase uptake resulting in desalinization of brackish or sea water. Marine algae may also be mass-cultured in sea water and harvested as a source of protein.

6). "Pesticides and Lake Rehabilitation." By Robert O. Sylvester, Prof. of Sanitary Engineering and Richard H. Bogan, Associate Prof. of Civil Engineering, University of Washington.—About 30 pesticides were investigated to determine their susceptibility to biochemical oxidation. Only malathion appeared to be subject to rapid biochemical oxidation. At present the oxidation by-products are being studied. In addition investigations are being made for the rehabilitation of Green Lake and its environment.

7). "Toxicity of Selected Ions on Activated Sludge Treatment." By E. Q. Moulton, Associate Prof. of Civil Engineering and George P. Hanna, Jr., Associate Prof. and Director, Water Resources Center, Engineering Experimental Station, The Ohio State University.—Investigations are being conducted to determine the effect on the activated sludge process of specific ions being discharged into sewers and water-courses from industrial plants. In addition, studies are being initiated involving the possible use of sequestering and/or chelating agents as a means of immobilizing various ions which have been proven to have an

How to Protect Concrete Sewers from Chemical Wastes



T-Lock Amer-Plate is a high polymer PVC sheet, easily cast into pipes, tunnels and structures to form a partial or complete 360° protective lining. Used in inverts, it permanently protects concrete from corrosive chemical effluents. In arch areas, it positively stops oxidized H₂S corrosion. T-Lock is also highly abrasion resistant; impartial tests show that it abrades at only 1/70th the rate of concrete.

The fact that T-Lock ends erosion and corrosion problems in industrial and municipal sewer systems is attested to by more than five million square feet now in use. Write for complete data on this maintenance-saving lining before designing your next sewer.

Applicators strategically located throughout U. S. and Canada



Dept. BH • 4909 Firestone Boulevard • South Gate, California

921 Pitner Ave. 360 Carnegie Ave. 2404 Dennis St. 6530 Supply Row 111 Colgate
Evanston, Ill. Kenilworth, N.J. Jacksonville, Fla. Houston, Texas Buffalo, N.Y.

Sewer Cleaning Problems?

Solve them all with
POWERIZED
O'Brien
EQUIPMENT



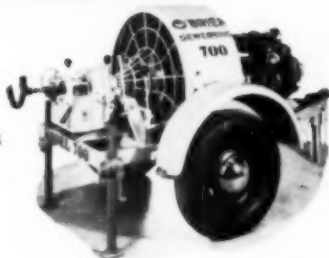
O'Brien
Power
Rodder
1000

O'Brien
Power
Rodder
RD100



Bucket
Machine and
Dumper

Sewerking
Cable Machines



O'Brien makes a complete line of sewer cleaning equipment. Every unit is the exact answer to a specific cleaning requirement and reflects O'Brien's long experience and familiarity with the field. Economy, efficiency, and convenience of operation are built into every piece of equipment.

O'Brien Power Rodder:

matchless driving and pull-back power, unexcelled for bucket threading and general sewer maintenance. 1200 ft. capacity can be used with either $\frac{1}{4}$ " or $\frac{3}{8}$ "-inch rod. Equipped with automatic safety throw-out, positive rod drive, and footage meter.

Bucket Machine and Dumper:

featuring exclusive O'Brien hopper. Bucket dumps into hopper; after repeated bucket travel, full hopper is dumped into truck. Use of hopper eliminates truck and traffic tie-up during cleaning operation which relieves truck for many hours of other duties while hopper is being re-filled. 9 hp., 16 hp., and 25 hp. models available.

Sewerking Cable Machines:

compact, powerful, economical cable rodder. Ideal for removing roots, grease, sludge and general sewer waste. Four Sewerking cable models available with capacities from 250 to 600-feet.

Rodding Equipment and Accessories:

O'Brien manufactures a complete line of powerized cleaning equipment accessories and universal replacement parts for all makes of sewer cleaning units.

Dept. PW860

Nationwide sales and service

Demonstrations anywhere

O'Brien MANUFACTURING CORP.

5632 Northwest Highway, Chicago 46, Illinois • Phone: RO 3-7433

Call or write for details or see O'Brien in action on your sewer problem. No obligation, of course!

"See us at the convention booths B-83 and B-84"

Large Volume Collection Problems

solved with the modern, flexible



CONTAIN-O-PACK SYSTEM



SAME PACKER HANDLES CONTAINERIZED AND MANUALLY LOADED REFUSE FOR MIXED ROUTES!

Here's the System . . . time-proved M-B Packer Body with compacted volume capacities from 20 to 28 cu. yards; a powerful hydraulic side-loading extendible boom; hinged-top, rodent proof, steel containers in 1½ to 3 cu. yd. sizes; plus a 36" wide hand-loading door on both sides for double duty on mixed routes.

Here's What You Can Do . . . 3000 lb. capacity side-loader with extendible boom reaches containers on loading docks, over curbing, between cars, over fences — versatility unmatched by any front or rear loading unit.

Here's How You Save . . . any standard, less expensive truck can be used; no heavy hydraulic packing mechanism or complicated tailgate involved; side loading feature with controllable outrigger eliminates fish plating, extra springs or other truck modifications. M-B costs less to buy, operate, maintain.

PACKS ANYTHING WITH FAST, SAFE "PUSH-OUT" UNLOADING



More and more private haulers, industrial plants, cities and towns are converting to the flexible Contain-O-Pack System. Full details and a demonstration are available from your distributor, or write the M-B Corp., New Holstein, Wisc.,

Dept. PW



LINE MARKERS



PACKER BODIES



SWEEPERS



QUALITY MUNICIPAL AND INDUSTRIAL EQUIPMENT SINCE 1907

effect on the various biological stabilization processes.

8). "Separation of Solids in the Anaerobic Contact Process." By A. J. Steffen, Director of Sanitary Engineering, Wilson & Co., Inc. and Miles Bedker, Chief Operator, Waste Treatment Plant, Wilson & Co., Inc., Albert Lea, Minn. —From the results of these studies it was concluded that vacuum degasification is the most economical and practical method of producing gravity separation of the anaerobic solids in the mixed liquor in the anaerobic contact process. However, information obtained indicates that direct aeration and air flotation present possibilities in achieving this same end under less stringent effluent quality requirements.

9). "Factors Inhibitory to Sludge Digestion." By Jay S. Grumbling, Research Engineer, and Clair N. Sawyer, Director of Research, Metcalf and Eddy, Engineers, Boston, Mass. —The objectives of the current research are directed toward isolating and identifying the bactericidal and bacteriostatic agents responsible for the inhibitory effect on the methane formers during the anaerobic digestion of sewage sludge. The results indicate that it is impractical to thicken raw sludge having volatile solids of more than 65 percent to more than 8 percent solids because of the difficulty in mixing this viscous batter into the contents of the digester.

10). "Volatile Acid Formation During Sludge Digestion." By James E. Etzel, Ass't. Prof. of Sanitary Engineering and Frederick G. Pohland, Graduate Research Assistant, Purdue University. —Preliminary studies indicated that digestion at volatile solids loadings of about 0.1 lb per cu. ft. of digester capacity gave rise to total volatile acid concentrations in excess of 2,000 mg L (as acetic acid) in the thermophilic temperature range. At the same loading rate the total volatile acids concentration in the mesophilic temperature range was only about 200 mg L (as acetic acid). Subsequent digestion studies were made in the thermophilic temperature range at 140° F. to observe the effect of changes in organic solids loadings on the formation of total and individual volatile acids, and to determine whether any changes occurred in the individual acids concentrations prior to the start of interference with gas production.

11). "Irradiation Sterilization of Diets for Germfree Animals." By John L. S. Hickey, Chief, Germ-

Free Services Section and Donald L. Snow, Chief, Sanitary Engineering Branch, Division of Research Services, National Institutes of Health, Bethesda, Md. — Medical research is actively using "germ-free" laboratory animals to study such problems as bacteria-protozoa interrelationships in amebic dysentery, and the role of microorganisms in dental diseases. Germ-free animals are first obtained by Caesarian section, and then must be kept in closed chambers or "tanks" to protect them from contact with the research investigator and from water, food and air-borne routes of contamination. All diets must be sterilized before they are brought into the germ-free chamber. Steam sterilization is the method ordinarily used. The study reported herein indicates that germ-free guinea pigs fed on irradiation-sterilized diets more closely resemble the conventional species of guinea pig than those reared on steam-sterilized diets.

Other Articles

"A Review of the Literature of 1959 on Waste-Water and Water Pollution Control." This second of three sections of the Literature Review covers industrial wastes, including radioactive wastes. By the Research Committee, Water Pollution Control Federation. H. Heukelekian, Chairman. Journal Water Pollution Control Federation, June, 1960.

"New Dryers Speed Milorganite Production." Milwaukee replaces old units with more efficient equipment to gear production to increased sewage flow. By Wm. Landsiedel, Plant Superintendent, Sewage Disposal Plant, Milwaukee, Wis. The American City, June, 1960.

• • •

A Correction To An Article on Gate Valves and Hydrants

On pages 232 and 233 of the May issue of PUBLIC WORKS a tabulation regarding the use of valves and hydrants contained incorrect figures. On page 233, in Table 1, the 2" to 12" valves in use in 1958 are shown incorrectly as 3,453.1 thousands, or 94.9 percent. The correct number should be 3,090.0 thousands. The percentage figure is correct.

Heavy Rainfall in Binghamton

On June 17, 1960, Binghamton, N. Y., had a heavy rainfall. The Weather Bureau reported more than 3 inches of rain in 3 hours, of which 2½ inches fell in 45 minutes. This is more severe rainfall than that indicated by the 15-year rainfall-intensity curve of New York City.

PUBLIC WORKS for August, 1960



DIXON PAINTS LAST LONGER

This water tank shown is in Yonkers, New York and was painted over 15 years ago with Dixon paints. It's still getting good protection from sun, snow, sleet and rain!

This is not an unusual record for Dixon paints which, when properly applied, double normal paint life. This is proven out by Dixon customer records dating back for over 60 years. Cut your maintenance costs and give your water tank longer life with Dixon paint.

DIXON SILICA-GRAPHITE PAINTS FOR WATER TANK INTERIORS



These paints, which will not add odor, taste or color to the water, give maximum protection to the interior of your tank. When the tank expands and contracts the paint will not flake or crack because the interior paints, like the exterior paints, contain flake Silica-Graphite.

SEND COUPON TODAY FOR INFORMATION THAT WILL SAVE YOU MONEY!

DIXON

JOSEPH DIXON CRUCIBLE CO. Jersey City 3, N. J.
Paint Products Division, Dept. PW-8

Gentlemen:

- ☐ Please send free sample contract forms and specifications which will enable me to get a quality paint job for less money.
- ☐ Please send me a FREE copy of brochure "ENGINEERED PROTECTIVE MAINTENANCE for the Water Industry" (V-90)

Name _____ Title _____
Organization _____
Address _____
City _____ Zone _____ State _____



Weight and Volume of Municipal Refuse

INTERESTING data have been received from a questionnaire returned to the Editors of PUBLIC WORKS by city engineers and others in charge of refuse collection. Of the 1455 replies which gave a definitive reply, 157 cities stated that the weight of refuse was recorded while 1298 said they did not record the weight of collected refuse.

The weight of refuse was reported in two ways: 1) The weight per cubic yard in place in packer-type collection vehicles; and 2) the aver-

age collection per person per day in pounds. As expected, replies in both groups showed a wide variation. Of the 127 cities reporting weight per cubic yard as stated above, 41 reported 400 lbs. or less; 43 reported between 401 and 500 lbs.; 15 between 501 and 600 lbs.; 12 between 601 and 700 lbs.; and 16 reported a weight of more than 700 lbs. per cubic yard in place in the packer type collection vehicles. These rather arbitrary groupings were used for tabulating purposes,

but the various cities reported more precise figures individually.

A similar rather wide variation was shown by the 112 cities which reported the average collection in pounds per person per day. Typical of some of the replies was the San Francisco data: "Varies; averages 852 tons per day for 312 days; 1,704,000 pounds divided by 775,000 population amounts to 2.1 pounds per person per day." Porterville, Calif., reports ± 2500 cu. yds. per month from 8,000 population. Winston-Salem, N. C., has 30 lbs. per family for two collections a week. Cuyahoga Falls, Ohio, says "we pick up an average of 38 lbs. at each residential stop." Gainesville, Fla., reports 26 lbs. per residence. Neither of these two cities states frequency of collection. Youngstown, Ohio, reports 60 lbs. per week per family.

For purposes of overall comparison, the 112 replies regarding per capita production were grouped and tabulated as follows: one pound or less per person per day, 4 cities; more than one pound but not over 2 pounds, 23; more than 2, not over $2\frac{1}{2}$ lbs., 13; more than $2\frac{1}{2}$, not over 3 lbs., 16; more than 3, not over 4 lbs., 14; over 4 lbs. per person per day, 42.

Even if consideration is given to the general difficulty of getting accurate data on refuse weights and volume, due to local conditions including possible use of home and commercial garbage grinders, collection policies, variations in collection frequencies and types of collection equipment used, there are indications that the overall volume and the per capita weight contributions are increasing.



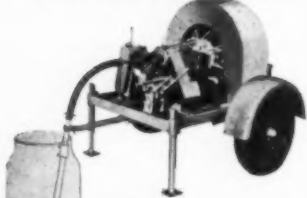



Of particular interest was the report that only 140 of the 1455 cities "collect by contractors, other governmental agencies or private firms." Only 4 cities reported no collection service.

ROCK SALT FREEZE-PROOFS REFUSE TRUCKS

A. W. KONEFES

Superintendent of Equipment
Department of Streets & Sanitation
Chicago, Illinois

COMBINATIONS of wet and freezing weather formerly played havoc with our refuse truck schedules. The problem was the freezing of loads in the truck bodies.

<p>ONE SOURCE for ALL SEWER CLEANING EQUIPMENT <i>"Flexible"</i></p>	<p>SEWERODER</p> 
<p>TRUCK-LODER</p> 	<p>COILRODER</p> 
<p>BUCKET MACHINE</p> 	<p>MONORODER</p> 
<p><i>"Flexible"</i> Develops, Manufactures and Sells— ... the equipment with the <u>most</u> exclusive features for cleaning your sewers faster, safer and more economically.</p>	<p>POWER DRIVE</p> 
<p>FLEXIBLE INC.</p>	<p>3786 DURANGO AVE., LOS ANGELES 34, CALIF. 1005 SPENCERVILLE ROAD, LIMA, OHIO 415 S. ZANGS BLVD., DALLAS, TEXAS</p>

The City of Chicago has an average of 400 trucks in operation. These trucks normally haul over 1000 loads of refuse per day. Because of the growth of refuse collection in the City, it was necessary to build two incinerator plants. We supplement the incinerator capacity by moving surplus quantities of refuse to a City-owned dump in transport trucks. The latter are 42 ft. long, capable of hauling five times a regular-sized load, and are equipped with a chain conveyor on the floor of the body to remove the refuse. The trucks were needed 24 hours a



● USE OF rock salt in refuse collection vehicles such as this transport trailer prevents loads sticking to body.

day but loads adhered to the bottom of the beds so the chain conveyors were ineffective in unloading during periods of wet and freezing weather.

For our normal pick-up hauls, we employ several types of trucks: The Roto-Pac or "loader packer" type; the Gar-Wood or "batch packer" type; and the Leach or "load packer" type. Invariably, in these trucks also an excess amount of moisture was loaded into the bodies, after even a light snowfall. When loads would freeze, costly, time consuming efforts, such as heating the underside of the truck bodies were required to permit unloading.

We solved this problem when faced with wet and freezing conditions, by spreading roughly 100 lbs. of Morton rock salt in each empty truck body before it left the garage. The salt kept the load from freezing to the bottom of the truck body and actually made the load slide out easier than when dry.

Modern Fire Alarm System Helps Lower Insurance Rate

A new fire-alarm system for College Park, Ga., has been installed by Gamewell. Other steps toward a lower fire insurance rating include construction of a modern and efficient fire station.



KRALOY PVC RIGID CONDUIT before encasement in concrete slab. Its mirror-smooth interior walls make fishing easier.

ABSOLUTELY NO CORROSION, LOW COST INSTALLATION, WITH KRALOY PVC RIGID CONDUIT

Continuing research and laboratory quality control — plus U/L listing* — have made KRALOY PVC RIGID CONDUIT a major advancement in electrical raceways. Not affected by rust, rot, pitting or soil electrolysis, KRALOY PVC CONDUIT has properties that make it the preferred conduit. Precision-extruded, corrosion-proof KRALOY is non-magnetic, non-sparking, won't support combustion. Its mirror-smooth walls make fishing easier — and its amazing light weight (approximately 1/6 the weight of steel, 1/2 that of aluminum) makes its easier to carry, handle and install. KRALOY PVC CONDUIT needs no threading, can be cut easily and joined by a simple solvent weld. It never needs painting or coating. And contractors report that installation costs are cut as much as 20% with KRALOY PVC on the job. If you'll consider KRALOY'S trouble-free characteristics and the money that can be saved in installation, you'll specify KRALOY PVC CONDUIT on your next job. Send the coupon today for the full story on KRALOY — the first and only PVC conduit with U/L listing*!

NOTE THESE WEIGHT COMPARISONS (LBS.)

Trade Size	1/2"	1"	2"	3"	4"	5"	6"
KRALOY PVC	15.0	29.0	63.0	131.0	187.0	253.0	326.0
ALUMINUM	27.4	53.0	115.7	238.9	340.0	465.4	612.9
STEEL	79.0	153.0	334.0	690.0	982.0	1334.0	1771.0

Kraloy Plastic Pipe Co., Inc., Dept. PW-8
402 West Central Avenue, Santa Ana, Calif.

Gentlemen: Please send me your new Brochure on KRALOY PVC CONDUIT which gives complete information and installation directions.

Name _____
Address _____
City _____ Zone _____ State _____

KRALOY PVC CONDUIT is sold only through wholesale electrical supply houses.



NO CONDUIT REPLACES

KRALOY

*For direct underground burial or encased in concrete.

PEDESTRIAN SAFETY IMPROVED BY "VOCALITE"

IN THE FIELD of pedestrian safety one of the greatest obstacles is the inattention of the pedestrian himself. Despite illuminated "Walk-Don't Walk" signals at heavy pedestrian crossings, hazardous jaywalking is likely to continue.

Now a new attention-getter is available to the traffic and safety engineer. This is the "Vocalite," a fully automatic audio pedestrian traffic signal which is adaptable to any standard traffic controller. By delivering a pre-recorded message at each cycle of the traffic light it appeals to the dual sensory perception of people, sight with sound. The Vocalite voice is directional and the sound intensity can be adjusted from a localized whisper to any volume required according to the sound of traffic. Circuitry of the unit is fully transistorized, and the message will



● WARNING message is synchronized with signal lights to admonish jaywalkers.

automatically synchronize itself with the traffic lights within one signal cycle.

Its effectiveness as an aid to pedestrian safety has been demonstrated by studies which show a 90 percent reduction in jaywalking after installation at crossings which

already had illuminated pedestrian control signals as well as conventional traffic signals. It is especially valuable at intersections having a high rate of physically handicapped or blind persons. "Vocalite" is made by Arnold Products Co., Long Island City, New York.

NEW EQUIPMENT SPECIAL

NEW YORK

See us at the 1960
PUBLIC WORKS CONGRESS
AUGUST 14 Thru 17

IMPROVED BUCKET MACHINE

NEW TRUCK LOADER

MODE RN HYDRODER

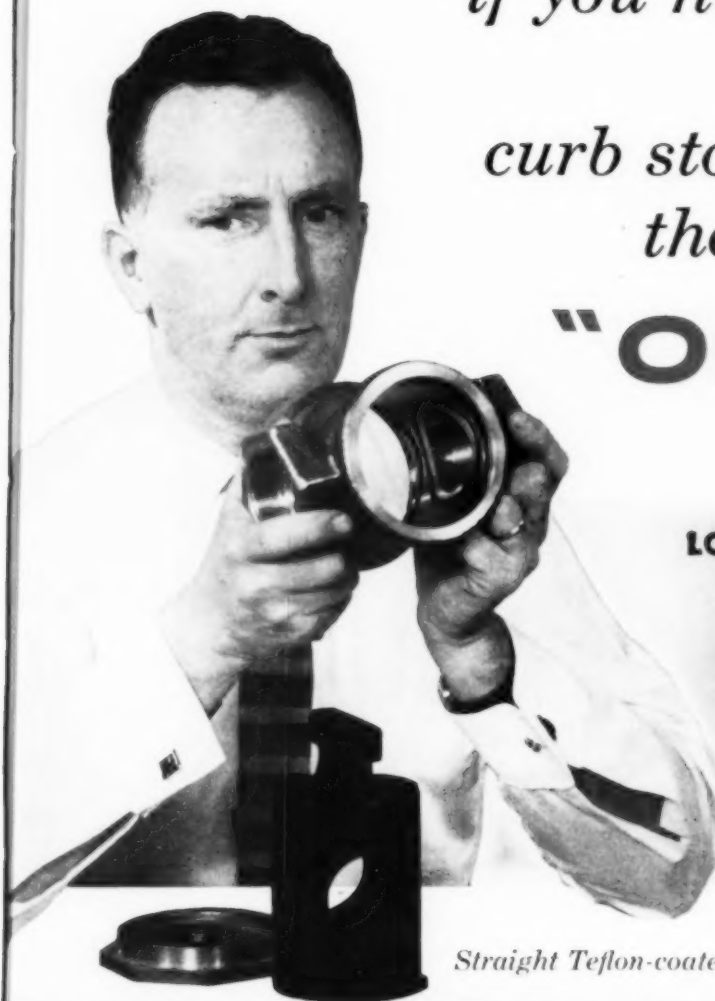
APWA

stewart

CHAMPION CORPORATION

*if you have problems
with "sticking"
curb stops, look into
the new Mueller[®]*

"ORISEAL"



LOOK INTO THE IDEAL CURB VALVE

- *Investigate the easy turning design features*
- *Investigate the long-life operating dependability*
- *Investigate the many reasons behind its amazing performance record.*

Straight Teflon-coated plug . . . "O" rings in the body

■ Twelve years of intensive field testing have proved the big advantages in the Oriseal's simple, sturdy design. After 25,000 to 45,000 cycling operations, this curb valve remained leakproof, remained easy to turn and had required no periodic service maintenance of any kind.

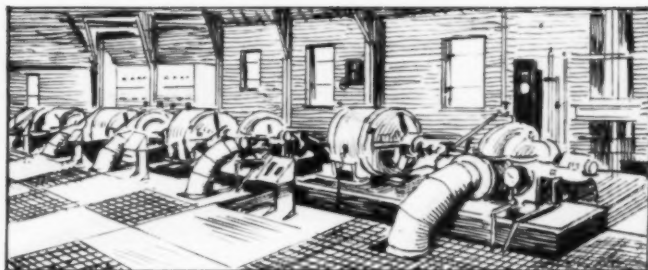
See your Mueller representative or write today for complete Oriseal test information. If you have experienced "sticking" curb stops, test an Oriseal Curb Valve in your water system and prove its many operating advantages.



**MUELLER CO.,
DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario.

THE WATER WORKS DIGEST



Prepared by **ALVIN R. JACOBSON, Ph. D.**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Progress in Ion Exchange

Twenty years ago the field of ion exchange was limited almost entirely to the softening of water for use in boiler plants and the occasional processing plant or commercial laundry. Certain natural materials or greensands were the only ion exchange materials available for limited application in the removal of calcium and magnesium ions through the substitution of sodium ions. Today, however, ion exchange is a versatile tool for water treatment applicable in cases too numerous to mention. The authors discuss the ten most significant developments in the field of ion exchange during the past 20 years. In the field of water conditioning the most important developments are the organic cation resins, weakly basic anion resins, strongly basic anion resins, hot lime-sodium cycle exchange, chloride anion exchange dealkalization, mixed bed deionization, counterflow regeneration, automation of equipment, high flow-rate ion exchange and continuous ion exchange. Each of these developments is reviewed both in the light of its historic place and the manner in which it increased the usefulness of ion exchange techniques.

"Twenty Years of Progress in Ion Exchange." By W. S. Morrison and Joseph Thompson, Vice Pres. and Eastern Manager, respectively, Illinois Water Treatment Co., Rockford, Ill. *Water & Sewage Works*, June, 1960.

Protective Coatings

- Success attained in a preliminary investigation using synthetic recirculated water with a low momentary excess (ME) of calcium carbonate and containing colloidal calcium carbonate suggested that a

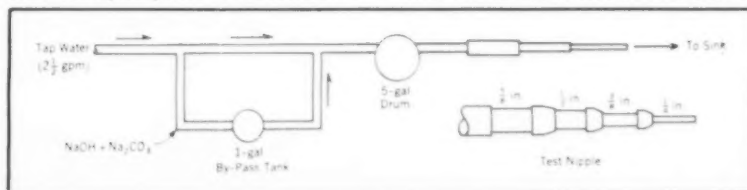
practical field method might be devised for developing permanent protective coatings in metal water pipes in a relatively short period of time. In a series of tests made at Michigan State University a continuous flow of tap water was divided to feed sodium hydroxide and sodium carbonate to a bypassed portion. Bypass and main flow were mixed and then passed through a 5-gal. plastic mixing drum, discharging to waste through a series of short test sections of sandblasted black iron pipe. The test nipples, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{3}{8}$ and $\frac{1}{4}$ inch in diameter, were joined in series by iron reducers. Velocities in the nipples were 1.5, 3.4, 8.0 and 13.5 fps. Sodium hydroxide and sodium carbonate were fed to produce a test water with a calcium carbonate momentary excess of 5 ppm and pH of 8.1. From the data and qualitative observations reported from these and subsequent series of tests the following conclusions were made: 1) Michigan State University tap water develops, hard, dense, calcite coatings on nipples within a few hours at velocities of 8.0-13.5 fps and a momentary calcium carbonate excess of about 5 ppm.; 2) the addition of 0.5-1.5 ppm metaphosphate controls calcium carbonate precipitation and permits momentary-excess values as high as 100 ppm without encrustation of feed lines or piping; 3) Calcite coatings have been obtained with metaphosphate concentrations

of 2.2 ppm and calcium levels as high as 1,500 ppm (as CaCO_3); 4) the DFI (driving force index) and momentary excess (ME) values have proved to be more useful for predicting carbonate deposition than the Langleier or Ryznar indexes; 5) better coatings were obtained at high velocities than at low velocities, probably because of the decreased thickness of the laminar boundary film, more rapid mixing rate, and increased velocity distribution.

"Use of Polyphosphates for Developing Protective Calcite Coatings." By Robert F. McCauley, Assoc. Prof. Civil and San. Eng., Michigan State Univ., East Lansing, Mich. *Jour. A.W.W.A.*, June, 1960.

Strontium - 90 in Surface Waters

Strontium -90 in the environment is derived from three sources: fallout, fission product wastes from the atomic energy industry and residues from the use of Sr-90 for beneficial purposes. In order to obtain long-term information on change of Sr-90 content in surface waters, aliquots of the 1-liter water samples collected weekly were combined into a 13-week composite of about 4 liters for analysis. Levels of Sr-90 activity were determined for the major surface waters of the United States. From these values, it was calculated that the average runoff of Sr-90 in these waters amounts to



Courtesy Journal AWWA

● TESTS and research for developing permanent protective coatings in metal pipe used this set-up for preliminary experiments. Coating could be formed in a few hours.



Ageless Concrete Pipe Installed Next to Ageless Arsenal Foundation For Pittsburgh Water Distribution

The building on the right is located at 40th and Foster Streets in the City of Pittsburgh and is part of the old Allegheny Arsenal built in 1814. Dig down alongside its foundation and you'll find it as good today as the day it was laid, unaffected by moisture or the elements of the soil. This foundation is built of a material that is ageless when buried underground—stone.

The pipe line being installed is made of another material unaffected by the

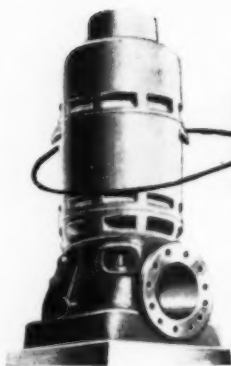
soil—concrete. The longer concrete is buried underground, the harder and stronger it gets and the more it assumes the characteristics of the limestone from which it comes.

This pipe line will serve the City of Pittsburgh for a long, long time.

Prestressed concrete steel cylinder pipe was used for the 42-inch, 1680-foot-long line which was installed under the direction of John A. Murphy, Director, Morris L. Wolf, Chief Engi-

neer, and John W. Bilotta, Distribution Division, Department of Water, City of Pittsburgh. Frank Kukurin & Sons, Inc., East McKeesport, Pa., was the contractor. The pipe was manufactured by Price Brothers Company, with headquarters plants at Hattiesburg, Miss. for the South and Dayton, Ohio for the North.

Price Brothers
CONCRETE PRESSURE PIPE



Another Important **FIRST**
By "VERTI-LINE" PUMPS...

HIGH-TEST "MOLY" IRON NOW "STANDARD" IN ALL Verti-Line® Pumps

Again Layne & Bowler sets new standards of quality construction for the pump industry... longer-life Molybdenum-Iron is now "standard" construction—at no extra cost—in ALL "Verti-Line" pump cases and other cast iron parts!

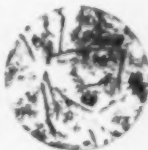
"Moly" iron has a more uniform grain structure, is far more corrosion-resistant than is the gray iron normally used in pump construction. Therefore, you get longer operating life, lower maintenance costs, when you specify Layne & Bowler "Verti-Line" Pumps!

COMPARE!

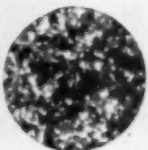


GREY IRON

► These Photomicrographs, both made at exactly the same enlargement (100x), show the structure of gray iron (left) vs. "Moly" iron (right). Note the long "stringers" of soft graphite characteristic of gray iron—stringers that weaken the metal and lead to early breakdown of the iron matrix. Note (right) how "Moly" iron is far more homogeneous, with uniform distribution of the iron matrix for longer pump life.

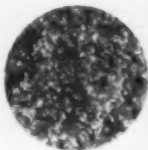


MOLY IRON



GREY IRON

► These "Fractures" (views across fractured surfaces) clearly show the much coarser grain of gray iron (left) vs. the uniformly fine grain of "Moly" iron (right.) Although Layne & Bowler's fine-grained "Moly" iron assures much longer pump life than the gray iron used in other pumps, you now pay nothing extra for this important "Verti-Line" advantage!



MOLY IRON

Layne & Bowler has its own modern foundry—therefore can standardize its foundry runs to "Moly" iron techniques at no extra cost to you.

And if your operations are extra tough, "Verti-Line" pumps are available in special "Moly" irons having a Brinell as high as 350... a Tensile as high as 50,000 psi!

Remember—"Moly" iron is just one of many major pump advancements built into every "Verti-Line" pump—advancements that assure top performance for your pump dollar when you specify "Verti-Line" Pumps!

For more details on the many "Verti-Line" advantages, write for Bulletin #200.



**LAYNE & BOWLER PUMP COMPANY
LOS ANGELES 22**

New York 20, N.Y. • Chicago 4, Ill. • Hastings, Neb. • Monroe, La.
Farwell, Texas • Twin Falls, Idaho • Fresno, Calif.

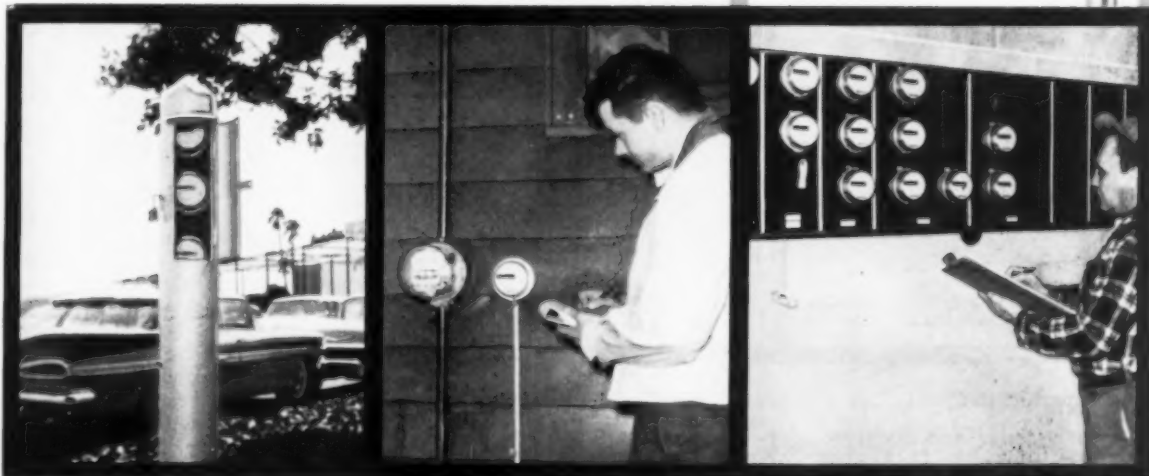
4 c/day, corresponding to 0.5 mc sq.mi yr, or 190 $\mu\text{c}/\text{sq.mi}/\text{yr}$. The total gross fallout contribution was calculated as 23,900 c/day, of which 409 c/day is found in runoff. Estimated rates of Sr-90 runoff, from 1958 and 1959 flow data in the Ohio River Valley, showed somewhat higher levels than the average value of 190 $\mu\text{c}/\text{sq.mi}/\text{yr}$. The current maximum permissible concentration level of Sr-90 in drinking water for an uncontrolled area is 100 $\mu\text{c}/\text{l}$. The contribution to general Sr-90 intake from water alone is quite small, certainly less than 5 percent of the maximum permissible concentration. Food, however, not water, is the major vehicle of Sr-90 intake. On the average, water may be responsible for 10 percent of ingested Sr-90.

"Strontium-90 in Surface Water in the United States." By Conrad P. Straub, Chief, Radiological Health Research Activities; Lloyd R. Setter, Chief, Radiological Investigations; A. S. Goldin, Chief, Radiochemical Analyses; and Paul F. Hallback, Asst. Chief, Radiochemical Analyses, all of Radiological Health Research Activities, Div. of Radiological Health, Robert A. Taft, San. Eng. Center, USPHS, Cincinnati, Ohio, *Journal A.W.W.A.*, June, 1960.

Hydraulic Research

During the past decade the Iowa Institute of Hydraulic Research has undertaken a series of studies of flow in the vicinity of quasi-stable eddies produced by separation at boundary angularities. The author described in the present paper the determination of the mean and secondary patterns of axisymmetric flow for two comparable boundary forms: the abrupt inlet and the blunt shaft. Measurements available for analysis included the distributions of mean velocity, mean pressure, longitudinal and radial intensities of turbulence, turbulent shear and longitudinal intensity gradient. Through use of the equations of momentum and of energy for the mean and the secondary motion, the measured distributions were adjusted to yield the required balance of the essential terms in the equations, thus producing results in general accord with physical requirements. There are presented in the form of the flow patterns themselves, supplemented by curves of variation of the individual momentum and energy terms throughout the regions of separation. Of particular significance is the interrelationship of turbulence, production,

Badger
Read-o-Matic's
**cost-cutting story is
 big as all outdoors**



*Pat. applied for in U.S.A.
 and foreign countries.

All over the country water departments are cutting meter-reading costs and increasing efficiency with Badger Read-o-Matic outdoor meter-registers.

Accessibility is the big advantage of this self-contained register. Read-o-Matics are installed *outside*, often in convenient "reading stations" which a meterman can read quickly and easily. This system is safer, too, because it completely eliminates the dangers involved in climbing down into underground vaults and other inconvenient locations.

Install this faster, lower-cost reading system in your water department. Write for literature or call your Badger representative for a demonstration.



Badger Meter Mfg. Co.

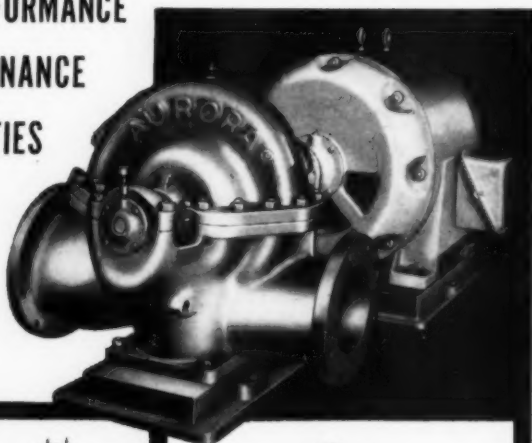
4545 W. Brown Deer Rd.
 Milwaukee 23, Wisconsin

AURORA® Split Case

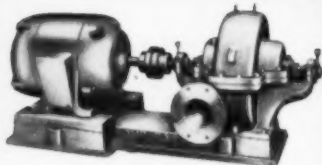
CENTRIFUGAL PUMPS

with

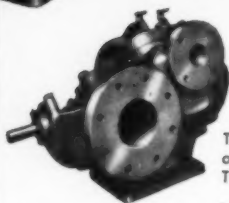
- SMOOTH PERFORMANCE
- EASY MAINTENANCE
- HIGH CAPACITIES



Type OJ Horizontally Split Single Stage Double Suction. Bulletin 105-B.



Type AJ Horizontally Split Two Stage Opposed Suction. Bulletin 106-B.



Type AJ Diagonally Split Two Stage

Bulletin 106-DS

- Capacities to 6000 GPM—heads to 600 feet—continuous operation.
- Both suction and discharge on bottom half of case . . . piping or motor-pump alignment never disturbed . . . lugs on top half of case for easy removal . . . by-pass in lantern ring exposed in lower half of case . . . fast, easy to inspect, clean and maintain . . . lines are back in operation fast!
- Streamlined liquid flow . . . hydraulically and dynamically balanced impellers . . . perfect alignment with in-line boring with top half of case in position . . . large standardized shaft sizes for maximum strength . . . short bearing centers for maximum rigidity and balance . . . low NPSH . . . smooth, long-term top performance . . . long life!

IDEAL FOR: Water Service • Boiler Feed • Circulating • Cooling Tower • Pressure Build-Up • Fuel Transfer • Boosting to Pressure or Elevated Tanks • Many General Applications.



FOR COMPLETE INFORMATION WRITE—OR CALL
AURORA PUMP DIVISION
 THE NEW YORK AIR BRAKE COMPANY

630 LOUCKS • AURORA, ILLINOIS

LOCAL DISTRIBUTOR IS LISTED IN THE YELLOW PAGES OF YOUR PHONE BOOK



convection, and dissipation, and the fact that a relatively small amount of turbulence energy is required locally to produce a large overall change in flow pattern. Two final diagrams indicate the variation of the terms of the Bernoulli equation extended to include the effects of turbulence and energy dissipation.

"Distribution of Energy in Regions of Separation." By Hunter Rouse, Iowa Institute of Hydraulic Research, State University of Iowa. *La Houille Blanche*, Mai, 1960.

Microstraining Removes Algae

Since June 1958, the Belleville, Ontario, filtration plant has had a marked reduction in the frequency of filter back-washes with a corresponding increase in filter runs. This result has been brought about by the installation of four microstraining units ahead of the existing alum coagulation basin, chlorination and sand filtration units. At the same time the capacity of the mixing and settling tanks was doubled. The purpose of the microstraining units was to reduce the algae load on the filters. As a result of these installations the frequency of back washing has been reduced to less than a quarter in number, while the volume of water used for both filters and strainers was reduced to a little over one-half the quantity needed previously for the sand filters alone. It is felt that these operating results could not have been maintained without heavy expenditure on additional sand filters, had it not been for the installation of the microstraining units.

"Microstraining Removes Algae and Cuts Filter Back-Washing." By James Scriven, Filtration Superintendent, Belleville, Ont., Canada. *Water Works Engineering*, June, 1960.

Sheboygan's Water Supply

Recently Sheboygan, Wisconsin, a community of 45,000, increased the overall capacity of its water supply from 18 mgd to 24 mgd. A new 36-inch reinforced-concrete intake extends approximately 2,100 ft. into Lake Michigan, supplementing two existing intakes. A new 12-mgd low-lift pump increases the raw water pumps to four. The new sedimentation tank consists of a two-level design divided into two sections longitudinally. Raw water flows to a new rapid-mix basin where liquid alum is added as coagulant. A weir divides the flow in half, one portion going through the

the
unt
red
all
nal
of
ion
of
n.
ous
se,
te-
wa.

lle,
l a
acy
re-
ns.
out
ro-
ing
ion
the
ing
he
its
the
la-
ing
a
me
nd
tle
led
ne.
re-
in-
ire
it
the

gae
By
n-
da.
ne,

, a
he
ply
36-
x-
to
wo
gd
aw
di-
ro-
ec-
ter
sin
a-
in
he



Irving, Texas...5,000,000 gallon prestressed concrete reservoir and pumping station. Built during 1957 by Whittle Contracting Company. Homer, Hunter Associates, Consulting Engineers. Prestressing by The Preload Company, Inc.

PRELOAD PRESTRESSED CONCRETE TANKS OFFER:

- ✓ Elimination of future maintenance expense
- ✓ 75% of contract price spent locally
- ✓ Availability
- ✓ Attractive appearance
- ✓ Over 20 years of design and construction experience

Price and design information available at no obligation.
Send for Bulletin T-22

THE PRELOAD COMPANY, INC.

- 355 Lexington Ave., New York 17, N. Y.
Tel.: Murray Hill 7-0488
- 351 Jefferson, Dallas, Texas
Tel.: Whitehall 1-5707

PRELOAD CONCRETE STRUCTURES INC.
837 Old Country Road
Westbury, Long Island, N. Y.
Tel.: EDgewood 3-4040

THE CANADA GUNITE COMPANY, LTD.
125 Hymus Boulevard
Pointe Claire, P. Q., Canada
Tel.: Oxford 6-6772

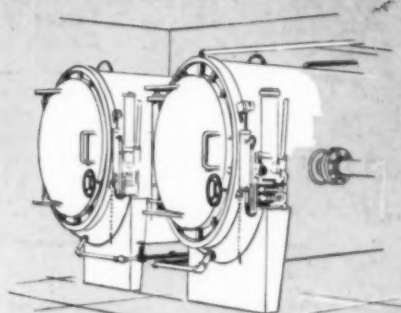
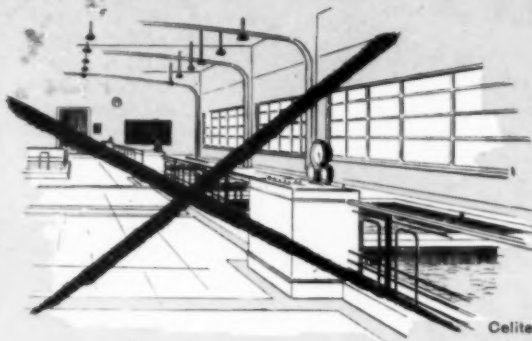
HERRICK IRON WORKS
28400 Clawiter Road
Hayward, Calif.
Lucerne 1-4451



PRINTED IN U. S. A.

38965

1. REDUCE FILTER HOUSING SPACE 75%



Celite diatomite filtration equipment takes up only about one-quarter the space of equivalent-capacity sand filter systems.

2. USE LOWER-COST CONSTRUCTION



Smaller floor space needed for diatomite filtration permits lighter, lower-cost building methods and materials.

You save filtration construction dollars these 2 ways with Celite diatomite

One installation after another proves you need about 75% less filter housing space for equivalent capacity when you use diatomite filtration with Johns-Manville Celite*.

Also, diatomite's lighter, smaller equipment permits you to use lower cost building methods and materials. For example, a simple concrete slab with light framing and siding instead of a large reinforced concrete-and-brick building with built-in concrete filters†.

Diatomite filter equipment is so compact because it provides a much larger filter surface in proportion to size of equipment. In many cases, raw water can be filtered directly—pre-treatment facilities can be eliminated. For Celite removes more suspended solids, including amoebae and algae, and turbidity is usually much lower. ◀

Mined by Johns-Manville from the world's largest and purest commercial diatomite deposit, Celite is carefully processed for purity and uniformity. It is available in a wide range of grades for best practical balance of clarity and flow rate with any suitable filter. For further information, see your nearby Celite engineer. For free technical reprints and illustrated brochure, write to Johns-Manville, Box 14, N.Y. 16, N.Y. In Canada, Port Credit, Ont.



*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.

†See *Comparison Studies of Diatomite and Sand Filtration* by G. R. Bell, Journal American Water Works Association, September, 1956 or write for free reprint.

JOHNS-MANVILLE

new flocculation and sedimentation basins and the other portion through the existing basins. The dry chemicals used as needed include carbon, sodium fluoride, bentonite and alum. Pre-and post-chlorination are provided. The two newly completed filters of 3 mgd capacity each are provided with surface washing equipment. Additions to the distribution system consist of new feeder mains and more storage. These additions represented an investment of approximately \$1,500,000, bringing the total capital investment to about \$4,700,000. To finance this program it was neces-

sary to issue bonds and increase water rates by about 45% overall."

"Water Is Free." By Jerome C. Zufelt. Superintendent, Board of Water Commissioners, Sheboygan, Wis. *The American City*, June, 1960.

Intensity-Duration Curves

The Engineering Department of the City of Oakland, California, recently revised the rainfall intensity-duration curves used in the rational method for the design of storm culverts. The author provides a brief account of the development of these

curves now being used which will result in a 14% decrease in intensity values for design. The data used in the development of the new rainfall curves was taken from automatic rain gage records collected over a period of 54 years. The records were tabulated for maximum amounts of rainfall recorded during periods of 5, 10, 20, 30 and 40 minutes and for periods of 1, 2, 3, 4, 6, 12 and 24 hours. This information was then converted to the actual rate of rainfall in inches per hour. A table was arranged with the number of storms equalling or exceeding each rate of rainfall for a given time interval. Rates were placed in convenient values ranging from 4.0 to 0.10 inches per hour. The theoretical rate of rainfall or "intensity" (in inches per hour) that would be equaled or exceeded but once in a given number of years was then computed. The intensity of rainfall was computed for each time interval and then plotted on log-log paper with time versus the reciprocal of intensity. The curve through these points closely approximated a straight line and a logarithmic equation was developed for the best fit to the actual value. The logarithmic formulas have been adopted to the best practical equations to fit the rainfall pattern in the City of Oakland resulting in an annual saving of approximately \$24,000 for storm sewer construction to care for the 15-year storm.

"City of Oakland Develops New Rainfall Intensity-Duration Curves." By Donald M. Winton, Associate Engineer, Street and Engineering Department, Oakland, California. *PUBLIC WORKS*, July, 1960.

Other Articles

"Contribution a l'Explication des Phenomenes Intervenant Dors d'un **Pompage** dans un Forage n'Atteignant pas l'Impermeable." Contribution to the explanation of phenomenons occurring during pumping in a drilling when not reaching the water-proof area, par R. Hazon, Chef du Bureau Technique du Centre des Etudes Hydrogeologiques du Maroc. *La Technique de l'Eau*, 15 Mai, 1960.

"Resultats d'Exploitation de la Station d'Adoucissement des Eaux de la Distribution de Tournai." Results of the working of the water softening station for the supply of Tournai. par M. F. Lefevre, Directeur des Regies de la Villo de Tournai. *La Technique de l'Eau*, 15 Mai, 1960.

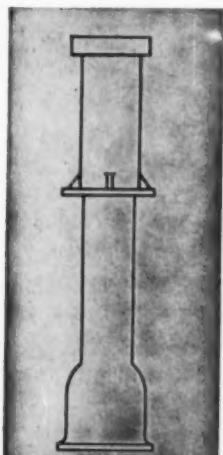
"Proposed Toxicity Screening Procedure for Use in Protecting Drinking-Water Quality." The carbon filter procedure described here is under consideration by the USPHS Advisory



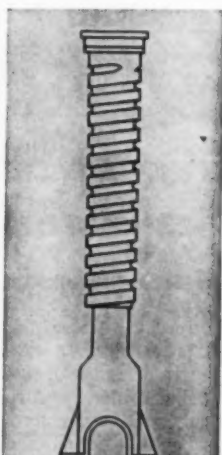
BUFFALO MUNICIPAL CASTINGS

are available in every size and style!

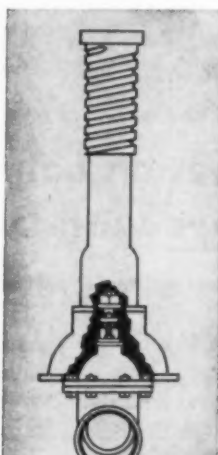
No matter what size, shape or style municipal casting you may desire — you're practically sure to find a "Buffalo" casting to serve your needs. Or, where desired, castings may be made to your own specifications. Whether you need valve, service or roadway boxes, meter boxes, manhole rings and covers or other municipal castings, you'll find all "Buffalo" castings designed for service and dependability.



2 pc. sliding type
adj. 5 1/4" valve box



2 1/2" water or gas
ext. service box



3 pc. screw type
5 1/4" valve box

Prompt quotations given on all your standard or special gray iron or non-ferrous castings.

Write or wire Dept. J for Bulletin M11.



BOX 55 — STATION B—DE 6764 BUFFALO 7, N.Y.

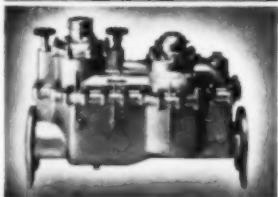
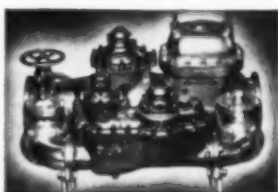


From this opening-



to full opening

NO ADDITIONAL PRESSURE IS REQUIRED
BY THE **HERSEY**
COUNTERBALANCED LEVER VALVE



Here you can depend on instantaneous, unimpeded maximum flow with no further loss of head, due to valve load, after less than 10% of maximum flow has been reached. This results from an immediate shift of the counterweight's center of gravity to a relatively balanced position.

The counterbalanced lever valve is an exclusive Hersey feature. It is an integral part of all Hersey Detector (Fire Service) and Compound Meters as well as Detector Checks. These are shown on the left.

Before you buy water meters of these types, compare the loss of pressure of Hersey. Their efficiency, accuracy and low maintenance costs can not be equalled. Let us give you more details.

Hersey-Sparling
Meter Company

HERSEY PRODUCTS
DEDHAM, MASSACHUSETTS

Committee on Revision of the Drinking Water Standards. By M. B. Ettlinger, Chief, Chemistry and Physics, Water Supply & Water Pollution Research, Robert A. Taft San. Eng. Center, USPHS, Cincinnati, Ohio, Jour. A.W.W.A., June, 1960.

• • •

More Coagulant Aids Approved

An additional group of coagulant aids has been announced by the Public Health Service as satisfactory for use in water treatment without adverse physiological effect on consumers, based on information supplied by the respective manu-

facturers and when used in concentrations not to exceed those recommended by the manufacturers. The coagulant aids approved are Mogul CO-983, Mogul CO-982 and Mogul CO-980, manufactured by North American Mogul Products Co.; and Permutit Wisprofloc-20, furnished by Permutit Div., Pfau-ler Permutit Inc. Permutit Wisprofloc-20 is identical to and replaces Permutit No. 68. These and similar products have been reviewed by a technical advisory committee established by the Public Health Service. This increases the list of approved coagulant aids to 26.



Single Lid Covers

FOR WATER METER SETTINGS

Type C Single Lid Ford Meter Box Covers provide meter readers and service men with easy access to water and gas meters set below grade. These strong covers, with overlapping lids, are made with 8" to 15" lid openings and are sized to fit standard 15" to 21" I.D. tile. Extra heavy covers are made in three sizes for street and driveway installations. All have the Lifter Worm Lock with forged silicon bronze bolts.



FORD

for better water services

THE FORD METER BOX COMPANY, INC., Wabash, Indiana

Design of Sewage Pumping Stations

(Continued from page 93)

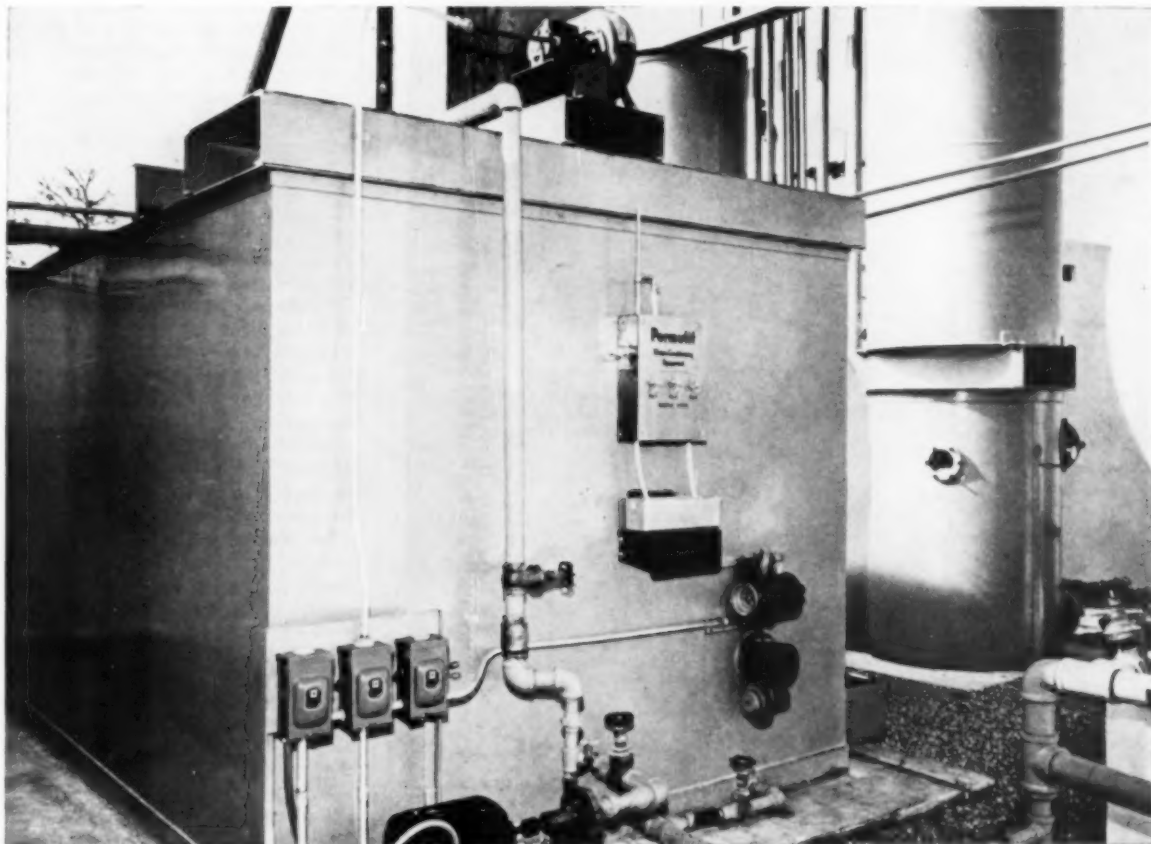
of a station electrical system must of course be appropriate and compatible with the available utility. Here again, for nearly identical stations, the electrical systems may consist of quite different equipment selections due to the available voltage, the required interrupting capacity of equipment and the regulations of the power system.

The most economical selection of electrical equipment is possible in those cases when the available voltage matches the standard voltage classification of the required drive apparatus. For example, drives requiring up to approximately 15 hp. are usually most economically served at 120 to 240 volts. Apparatus rated from 25 to 200 hp. is generally most economically served at 480 volts; whereas, higher service voltage will require either larger equipment or the cost of transformation. Generally, motor drives rated at 200 hp and above can be most economically served at 2400 to 4200 volts. Good voltage regulation generally is accompanied by higher short circuit capacity. The higher short circuit capacity requires the selection of equipment with greater interrupting capacity but also will generally result in permitting the selection of full-voltage starting equipment. The greater short circuit capacity with use of full-voltage starting equipment will nearly always prove to be an advantage and should normally be sought.

Having arrived at the initial station requirements and having coordinated the equipment with the power source available, other characteristics such as operating cost, safety, durability, appearance, ease of maintenance, and adherence to applicable standards must be given consideration. With the exception of the power factor of the station electrical system, other features of a well designed system do not appreciably affect power cost. Some utility rate schedules do not contain a power factor clause. Others include in their rate schedules a power factor clause which may have one of two forms; either a penalty is incurred for poor power factor or a bonus is given for a good power factor. Synchronous machines or capacitors may be used to improve the system power factor.

The safety features of a well planned system should include those for personnel, plant, and equipment protection. Personnel protection is generally covered by compliance

FLUIDICS* AT WORK



This Permutit packaged automatic plant treats water for Bahia Vista Estates, de luxe trailer community, in Sarasota, Florida. System contains degasifier, Precipitator, chemical feeders, two Automatic Valveless Filters.

New way to save money when you treat water for smaller communities

You're looking at a new idea in water treatment: a *packaged, automatic* plant, custom engineered by Permutit to save you construction, installation and operating dollars.

Such systems are now available for smaller communities using from 10 to 100 gpm. . . and at economical cost.

This is possible because of the range of sizes in which we offer standard, package equipment for each step in water treatment, including: removal of carbon dioxide, oxidation of ferrous iron or hydrogen sulfide, softening, removal of turbidity, chlorination, and filtration.

Fully automatic, low-cost operation. Your Permutit plant operates automatically, practically runs itself day

in and day out, keeping your labor and operating costs at a minimum. Even the filters automatically backwash themselves at the right time, rinse themselves, and go back into operation—without so much as a glance from an operator! The unique Permutit® Automatic Valveless Gravity Filter makes this possible.

Send for prices, details. At no obligation to you, we'll gladly give full details on how a Permutit packaged plant can be tailored to your local conditions. Write to: Permutit Division, Pfaudler Permutit Inc., Dept. PW-80, 50 West 44th Street, New York 36, N. Y.

*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.



PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS...the science of fluid processes



DARLING HYDRANTS

provide exactly the right type for special or unusual service needs

Above you see some of the many types of hydrants in the complete Darling line. With this wide selection, your system can include *exactly* the right types for special or unusual needs... all with unmatched Darling quality.

Darling's unique B-50-B design provides *ball-bearing* operation combined with "O" ring seals. This provides a packless, dry-top hydrant with no packing gland maintenance. Operating threads and bearings *stay* lubricated and water can't reach them.

Write us for complete information. Or we'll gladly have a Darling engineer call to discuss your needs.



DARLING VALVE & MANUFACTURING CO.

Williamsport 22, Pa.

Manufactured in Canada by

The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ontario

with the National Electrical Safety Code. Plant protection is generally covered by selection of apparatus which carries the Fire Underwriters approval, by selection of equipment employing noninflammable insulating media, and by employing enclosed dead-front type equipment construction. Equipment protection becomes complex and requires well planned safeguards. All switching equipment must be designed and applied to carry not only its continuous load, but also to withstand that great inrush of power which flows whenever a short circuit occurs. Suitably placed interrupting devices must be incorporated on the system which not only withstand, but can open and interrupt the short circuit. The selection and location of the interrupting devices depend upon whether the whole plant or isolated parts of the plant can be permitted to be taken out of service when a fault occurs. Overload protective devices should be applied to protect motors from overload and single phasing. The extent of application of additional protective devices, such as bearing temperature relays arranged for either alarms or automatic shutdown, depends to a great extent upon the planned attendance of the station. Unattended stations should be designed with automatic devices to shut down faulted equipment. Most sewage pumping stations are unattended.

Controls, under normal as well as abnormal conditions, must cause the station to perform in a certain manner under prescribed situations. These include apparatus and devices for starting and stopping, sequencing, alternating, regulating, metering, proportioning, and protecting. In achieving their function, the complexity of the controls varies over a wide range from simple manual control to fully automatic. To permit control suppliers to take full advantage of their own control equipment and their latest developments, it is desirable to refrain from specifying individual control components whenever the requirements can be functionally specified. Functional specifications should be very complete, defining not only quality of equipment and all conditions that must be met, but also such conditions that must be avoided. Controls should be located in properly ventilated areas, free from dirt and corrosive or explosive gases, protected from moisture, and easily accessible for maintenance.

Planned station lighting should go well beyond the installation of the minimum recommended 10 foot-candles of light for all spaces. It is

PUBLIC WORKS for August, 1960

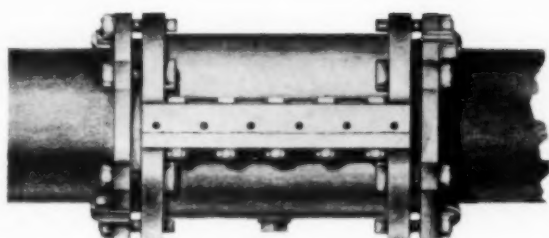


INSTALL

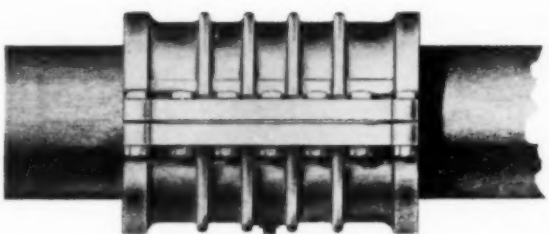
A

SMITH

SLEEVE



**Mechanical Joint
Repair Sleeve**



**Bell (Hub) End
Repair Sleeve**

Smith Repair Sleeves are the answer to permanently repairing and quickly returning broken and cracked piping to service. Two types of Smith Repair Sleeves are available for installation on standard classes of cast iron pipe. Smith Mechanical Joint Repair Sleeves are produced in sizes 4" thru 12"; Smith Bell (Hub) End in sizes 4" thru 48". Unskilled labor can speedily install Smith Mechanical Joint Repair Sleeves even in wet excavations. Bell End Repair Sleeves are most frequently installed with caulked lead joints. Smith Repair Sleeves reinforce the broken — cracked pipe and their service life equals the life of the pipe.

62



THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

necessary to analyze the traffic pattern and lay out a satisfactory switching arrangement for partial illumination in many cases. Some lights at strategic locations such as stairways, exits and control panels may be required to be left on continually. All lamp fixtures should be located where they are easily accessible for relamping. In equipment rooms, an even distribution of light may not be as important as the placement of sufficient light where it will be needed for maintenance and operation while giving a lesser light intensity at other areas where only cleaning is required. The selec-

tion of lighting fixtures depends upon the appearance and the general use. Fluorescent fixtures are more efficient than incandescent; however, they present a somewhat greater difficulty in arrangement and mounting in areas with piping, supports, and hangers. A lighting installation of one watt per square foot will result in approximately 7.5 foot-candles using incandescent fixtures and 15 foot-candles using fluorescent fixtures. In stations employing air conditioning, obviously, the use of incandescent fixtures may result in larger capacity air conditioning equipment.

Communication facilities, for unattended stations, must be equally as reliable and flexible as the power system. Some means of stored energy may be required for communications, control and power where it is necessary to supervise the station conditions and to shut-down automatically when loss of electric service does occur.

There is no single solution or guide to design properly the station electric system. Only an individual study and understanding of the purpose and method of operation of each station can insure that an adequate electrical system is provided.

Appurtenances

Appurtenances for a sewage pumping station can be many and varied. Stations which are regularly attended should be provided with toilets and wash rooms and where continuously attended should be provided with showers. The decoration and finish of the station interior should be conducive to easy cleaning and maintaining, and capable of creating a feeling of pride in the operators to the extent that they will want to do the housekeeping necessary to maintain an orderly and clean station. The design should preclude any water standing or running across floors. A slope of $\frac{1}{4}$ -inch per foot to drains is considered minimum for good drainage of floors in pump rooms, screen rooms and other locations where cleansing will be done by hosing-down or where spillage of sewage may occur. Drainage from pump glands should be piped from each unit to the building drainage system.

Facilities are required in many stations to preclude any possibility of contaminating the potable water supply. These facilities may consist of an air gap with repumping equipment, or acceptable backflow preventers (5).

Hoisting equipment is usually provided for removal of piping and equipment from pump pits and passenger elevators can be justified many times where deep pump pits are involved.

Adequate heating facilities are required for the climatic conditions involved, and in the warmer parts of the country the comfort air conditioning of the operators' room or office usually can be justified. Ventilation of the station is essential and most public health authorities will require at least six air changes per hour of continuous ventilation and a two minute air change for intermittent ventilation (6). Ventilation should be positive by means of

MITTS & MERRILL

AMERICA'S NO. 1

BRUSH CHIPPER



MITTS & MERRILL ANNOUNCES THEIR 1960
MODELS—WITH MANY NEW FEATURES!

WHY SHOULD YOU BUY A MITTS & MERRILL BRUSH CHIPPER?

Because Mitts & Merrill gives the following features without extra charge:

- | | |
|--|--|
| 1 Built-in, trouble-free blower | 7 Adjustable to produce large or small chips |
| 2 Staggered and tapered knives | 8 All-welded construction, safety-engineered for operator protection |
| 3 Largest diameter cylinder of any Chipper on the market | 9 Wears longer and has less moving parts |
| 4 Extra large feed chute with safety door and special supports | 10 Works faster at lower speeds |
| 5 Three-way direction discharge chute | 11 Available in 7 different models |
| 6 Adjustable chip direction bonnet | 12 Backed up by more than 100 years of experience |

the easiest to operate—the greatest efficiency
—the lowest upkeep and maintenance cost.

MITTS & MERRILL • 1005 So. Water Street • SAGINAW, MICHIGAN
BUILDERS OF SPECIAL MACHINERY SINCE 1854

Drop your pipe problem

OVERBOARD

...with **AMERICAN Molox Ball Joint Pipe!**

Specify **AMERICAN Molox Ball Joint Pipe** for river crossings and other difficult installations. Molox pipe affords maximum installation economies because it is easily adapted to several installation methods: It can be floated or pulled across streams, or can be installed directly on the bottom from a barge. Once laid, it remains bottle-tight under pressures up to several hundred psi at any angle within the 15° range of deflection for which it is designed.

AMERICAN Molox Ball Joint pipe offers all the advantages of high strength Mono-Cast pipe with the socket cast *integrally* with the pipe; a heavy section alloy steel follower gland for added strength; plus the finest bolting of any flexible joint pipe available today . . . high strength, corrosion-resistant **AMERICAN STAINLESS STEEL** bolts.

Before "plunging" into underwater pipe installations consider the advantages of **AMERICAN Molox Ball Joint Pipe**. Write for free illustrated brochure or contact your nearest **American Cast Iron Pipe Company** representative.



AMERICAN
CAST IRON PIPE CO.
BIRMINGHAM ALABAMA

SALES OFFICES: Chicago
New York City — Kansas City
Dallas — Minneapolis — Denver
Pittsburgh — Orlando — Cleveland
Birmingham

power driven equipment. In addition to these minimum requirements for ventilation, the ventilating capacity should always be adequate to dissipate the heat generated by the pump drives during hot weather.

Inherent safety in the layout and facilities of the station is essential. Adequate railing, toe-plates, guards around mechanical equipment, rubber mats in front of electrical gear, stairways, etc. should be provided for the protection of operators (7). Stairways are always preferable to ladders, and stairways with straight-runs are always preferable to circular stairs. Non-climbable fences

should be provided around exterior electrical equipment and other hazardous features of the station to prevent access by unauthorized persons and where required to prevent vandalism.

Bibliography

1. Benjes, H. H., "Sewage Pumping," *Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers*, June, 1958.
2. *Hydraulic Institute Standards* (Tenth Edition), Hydraulic Institute, New York 17, N. Y., 1955 (Revised 1958).
3. Parmakian, John, *Water Hammer Analysis*, Prentice-Hall, Inc., New York, 1955.



If You Need It, Buffalo Turbine Builds It. The Finest In Spraying, Dusting or Spray/Dusting Equipment.



The New Model FST-2 In Action

*The versatile Buffalo Turbine has multiple uses.
One machine does the work of ten. Use it for:*

- Pest Control
- Fire Fighting
- Soil Stabilization
- Groves
- Seeding
- Enzyme Deodorization
- Sanitation
- Golf Course
- Shade Trees
- Weed Control

*Several valuable territories open.
Dealers write for details.*

BUFFALO TURBINE
Agricultural Equipment Co., Inc.

80 Industrial Street
Gowanda, New York



4. Rich, G. R., *Hydraulic Transients*, (First Edition) McGraw-Hill Book Co., Inc., New York, 1951.
5. "Use of Backflow Preventers for Cross - Connection Control, Joint Committee Report," *Journal of American Water Works Association*, Vol. 50, No. 12, December, 1958.
6. *Standards for Sewage Works*, Upper Mississippi River Board of Public Health Engineers and Great Lakes Board of Public Health Engineers, February, 1959.
7. *Safety in Wastewater Works*, Manual of Practice No. 1, Federation of Sewage and Industrial Wastes Association, Washington 16, D. C., 1959.

• • •

Street Cleaning and Refuse Collection Costs

The street cleaning of the Borough of Leonia, N. J., is done by a motorized gasoline powered street sweeper, supplemented by hand sweeping of inaccessible gutters and catch basins. The street sweeper is an Elgin 3-cubic yard model. It swept 1,766 curb miles of street at a cost of \$3.01 per curb mile, for a total cost of \$5,317.34 consuming 1,019.4 gallons of gasoline, 5 fibre main brooms and 6 steel wire gutter brooms. The gutter wire brooms swept 294 curb miles each; the main fibre brooms swept 353 miles of curb each.

This sweeping cost is based on an empirical monthly overhead charge of \$161.68 (made up of \$49.18, an annual interest charge of 6% on the \$10,000 cost of equipment; \$10.50 insurance cost; \$20 garage rental; and \$82 depreciation); to this is added the gasoline cost, operator's time, cost of fibre, cost of steel wire, labor and parts costs. Hand sweeping costs came to \$25.00 per curb mile; the \$3.01 per curb mile for 1959 compares favorably with the \$3.54 of 1958; and is a tremendous saving over the hand sweeping.

Garbage collection personnel consists of two 3-man crews, using one 10-cubic yard Gar Wood Load Packer garbage truck. Each crew walks six miles daily and picks up the garbage from the back yards of 675 homes, averaging 25 cubic yards of garbage per truck daily.

Estimating a population of 8,000 or 2,700 families, with salaries at \$33,593; other expense of \$3,259; and amortization at \$3,600, the total cost of garbage and trash collection is \$40,452 or \$5.06 per capita per year. This cannot be matched by contract collectors who would charge \$8 per capita per year and furnish only two collections of garbage per week and would not furnish the present once per week trash collection.

Emile Husar is Director of Public Works of Leonia.

Public Works Aspects of URBAN RENEWAL

ON A QUESTIONNAIRE recently sent to city engineers, city managers and directors of public works, certain questions were asked to determine the extent and status of urban renewal. These questions were: Does your city plan an urban renewal program? Is such a program now in progress? If so, will it involve reconstruction, new water lines, new sewers, new street lighting and other new work?

A total of 1373 cities replied to the question on urban renewal work. Of these 319 plan such a program, and 21 were considering the program more or less hopefully; 1033 stated that no such program was now being considered. In answer to the question on the present status of the work, 233 said such a program was now in progress, while 215 stated no work was in progress.

The program contemplated by the cities now working on such projects, or planning initiation in the near future, indicate that a tremendous amount of work will be involved in street widening, relocation and paving; curb and gutter and sidewalk construction; storm drainage; parking; traffic lights and controls; lighting; and parks and playgrounds.

Of 313 cities reporting, 270 stated that the work would involve considerable reconstruction of existing facilities; 35 said reconstruction would not be involved; and 8 were uncertain at this time.

Specifically 284 cities said the work would involve new water lines or enlargements of existing lines; 13 were uncertain; and 55 said the planned work would not require new or enlarged lines. In regard to new sewers, 291 stated such work would be necessary; 15 were uncertain; and 51 said no sewer work was contemplated. In regard to lighting, 249 cities expected that new lighting would be needed in conjunction with rehabilitation; 39 stated more lighting would not be needed; and 15 cities were uncertain.

In addition to the above there were a great many statements covering the scope of the work planned. A partial list of the types of work reported as under contemplation includes: paving, widening and relocation of streets 137 cities; curb and gutter construction 24; storm drainage 29; sidewalks 19; parking 8; traffic lights 4; and parks and playgrounds 9.



No need
to
PEEK...

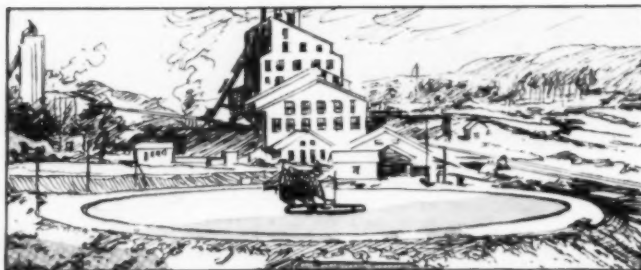
to see the
radically new

Colectomatic®
MARK II

See it at the APWA show, opening August 14 at the New York Coliseum. Stop in at the Heil exhibit, Booth No. A-10, and get a good look at a refuse collection unit that will set the pace for years to come — the great new COLECTOMATIC MARK II.

Then be sure to come in and relax with us in the HEIL hospitality room at the Hotel Manhattan. The Heil Co., Milwaukee 1, Wisconsin.

THE INDUSTRIAL WASTE DIGEST



Prepared by **CLAYTON H. BILLINGS**, Associate Editor

Research in Sanitary Engineering

Three articles summarizing studies in industrial waste treatment and disposal appeared in a series on sanitary engineering research in July, 1960, *PUBLIC WORKS*. These are "Occurrence and Behavior of Natural and Radioactive Strontium in Water," "Toxicity of Selected Ions on Activated Sludge Treatment" and "Separation of Solids in the Anaerobic Contact Process." Abstracts of these and the entire research series are included in the *Sewerage Digest* of this issue.

New Prefab Media For Trickling Filters

A plastic packing (high-impact polystyrene) for cooling towers, made by the Fluor Corporation, trademarked Poly-Grid, appeared to have the basic requirements for trickling filter media and was accordingly evaluated for application to industrial waste treatment. One of the wastes studied was that from quenching coke and scrubbing coke oven gases. Phenols and cyanide are the primary pollutants. Simultaneous laboratory and pilot plant studies were conducted. The pilot plant filters were 3 by 3 by 15-ft. towers. The initial hydraulic loading on the pilot plant filters was 4,320 gpd per sq. ft. Seeding was accomplished with a water extract of manure and Vigoro and diammonium phosphate were added as nutrients. The feed rate of phenol-cyanide solutions was increased daily to maintain removals of 90 percent. Maximum pollutant removals were 25 lb. per day per 1,000 cu. ft. for phenol and 17 for cyanide, using synthetic feed. Consistent removals of 95 percent for phenol and 90 percent for cyanide were ob-

tained. The laboratory tests indicated substantial agreement between results with synthetic feed solutions and equivalent concentrations of actual waste. The media was found to support growth only on vertical surfaces which should favor freedom from plugging and bridging by slime. No detrimental effects on the media were observed after a year's operation.

"Phenol-Cyanide Removal in a Plastic-Packed Trickling Filter." By J. A. Porter and P. H. Dutch, The Fluor Corporation. *Journal Water Pollution Control Federation*, June, 1960.

Sulfuric Acid From Pickle Liquor

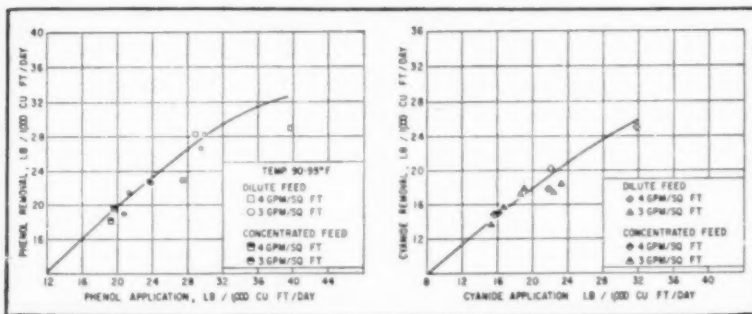
In keeping with the current effort to develop processes for waste pickle liquor, the consulting engineering firm of Singmaster and Breyer has worked out a method of regenerating sulfuric acid at a cost under \$15 per ton, cheaper than the purchase price of the acid. The pickle liquor regeneration process consists of three steps: 1) Concentration of the waste resulting in crystallization of ferrous sulfate monohydrate in a multiple effect evaporator, 2) roast-

ing of the ferrous sulfate in a multiple hearth furnace in a way to avoid generation of sulfur trioxide, and 3) the generation of 98 percent sulfuric acid in a package contact plant from the furnace gases. The crystallized ferrous sulfate from the first step is centrifuged to decrease the moisture content from 70 percent to 15 or 20 percent, prior to the roasting operation. The estimated total capital investment required to treat 100,000 gallons of pickle liquor containing 8.5 percent sulfuric acid and 13 percent ferrous sulfate, is estimated at \$2.11 million.

"Profitable Pickle Liquor Regeneration." By A. E. Dembitz, Singmaster and Breyer, New York. *Industrial Wastes*, June, 1960.

Management Practices In Waste Disposal

As part of the waste control activity at General Electric's Appliance Park at Louisville, Ky., the company has an intensive program for reducing waste quantity. The wastes are pretreated for discharge into the Metropolitan Sewer System of Louisville. Total flows average 5.5 mgd and costs of treatment in-



Courtesy Journal Water Pollution Control Federation
● TRICKLING filter application to industrial wastes. Left, phenol removal for phenol-cyanide synthetic waste with 4:3 phenol-cyanide ratio. Right, cyanide removal.

How Lincoln, Ill., sewage plant

SOLVED HEAVY GREASE LOAD PROBLEM

with one Dorrco Vacuator®

A large institution's decision to grind all its garbage threw a monkey wrench into Lincoln's plans for improving its sewage treatment plant. The institution was already a heavy grease contributor. Increased strength of the sewage would be tremendous. Calculations showed that Lincoln must be prepared to handle wastes equal to those of a town double its size!

Could the town alter its plans, handle the heavier loads and do it efficiently and economically?

It did — with the help of Dorr-Oliver equipment. In one major move a 26' dia. Dorrco Vacuator was installed for primary treatment and the original settling tanks became intermediate tanks. In the first year of operation, BOD removal through the Vacuator ranged from 19 to 27% — averaging 22%. Suspended solids removal averaged 34%. Not only that, the Dorrco Vacuator proved it could reduce digester requirements by pumping thick sludge averaging 3.6% in solids content to the digester. In short, the Dorrco Vacuator was a vital factor in solving Lincoln's problems — for years to come.

Complete information on the Dorrco Vacuator is readily available. Ask for Bulletin No. 6301. Or write Dorr-Oliver Inc., Stamford, Connecticut, for details on the complete line of sewage treatment equipment.

Plant Superintendent: Lawrence Arthur
Consulting Engineers: Crawford, Murphy & Tilly, Springfield, Illinois



DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

cluding complete system amortization are about 18 cents per 1,000 gal. A water-use management program included such conservation measures as recirculation of uncontaminated water, installation of water meters, use of countercurrent flow and installation of siphon breakers. One device, a conductivity meter, was attached to a rinse tank permitting water to be added only when contamination became severe. The water management practices result in a savings of about \$37,500 per year. Metering the plant discharge to the sewer system saves \$14,500. Reuse of spent acids for

waste neutralization and fertilizer manufacture has realized \$115,000. Purchasing carbide lime from a local acetylene plant for replacing high calcium dry lime results in savings of \$24,000 per year. In addition to these economies, the use of instrumentation for close control of waste treatment processes has reduced capital expenditures and labor costs. The latter saving is estimated at \$50,000 per year. The total annual expense avoided by the overall program is \$247,000.

"Economies in Metal-Finishing Wastes Management." By C. M. Fair, Supervisor Water Management

and Waste Control, General Electric Co., Louisville, Ky. *Journal Water Pollution Control Federation*, June, 1960.

Poultry Dressing Wastes

After investigating many sites, the East Anglia Packers, Ltd., which dresses 50,000 broilers per week, decided to locate their processing plant at Flixton, Suffolk. One of the principal advantages of the location was the existence of an ex-Air Ministry sewage treatment plant capable of modification to process the poultry plant waste. The treatment plant consists of upward flow tanks, bacteria beds and humus tanks. A third set of tanks operating in parallel with the dual tanks was added together with sludge drying beds. The ultimate capacity of the boiler plant is expected to be 100,000 birds per week which could produce a BOD load between 160 and 240 lbs. per day. It appears that the bacteria beds can be increased in size from the present 882 cu. yds. to 1128 cu. yds. which will give a loading at maximum BOD production of 0.21 lb. of BOD per cu. yd. Wastes are segregated into washings following blood recovery as stage one, wastes from plucking as stage two and those from eviscerating as stage three. Stage one wastes are very strong and are retained during washing down for slow discharge either simultaneously with or immediately following wastes from stage two. Stage three wastes are passed through a rotating brush screen for removal of offal before being discharged to the treatment plant. By treating stage three wastes continually and mixing them with wastes from stages one and two during the 7 to 8 hr. off-production period of the day, the use of balancing tanks has been avoided.

"Broiler Wastes Disposal." *Contractors Record and Municipal Engineering*, June 15, 1960.

Other Articles

"Industrial Wastes I Have Known," by C. M. Dixon. Experiences with waste acid disposal from the manufacture of gunpowder and with treatment of phenol wastes, are summarized in reminiscences of a construction engineer who is now Director of Utilities at Boulder, Colorado. *Wastes Engineering*, June, 1960.

"Performance Standard Zoning Air Pollution," by M. A. Salzenstein and W. C. McCrone. A new basic philosophy is developing in zoning regulation of industry, taking into consideration the effect of plant operation on the surrounding community. *Industrial Wastes*, June, 1960.



The "3-Ms" in M & H Products

There are 3 Ms in M & H production operations which explains to some extent the wide popularity and increasing sales of M & H valves, hydrants and accessories. The 3 Ms are Men, Machines and Materials. They are the foundation of the superior design, rugged strength and high quality which users of M & H valves and hydrants have so widely recognized.

It requires all three in combination to produce a product which meets M & H standards. M & H foundry raw materials (pig iron, molding sand, everything) and the finished castings (cast iron or bronze) meet latest engineering standards. M & H foundry and machine shop both have efficient, modern equipment. Far more important than either of the foregoing, M & H workmen are craftsmen—skilled in their respective jobs, proud of their work, loyal to their Company and as much interested in making a good valve as is the boss in the office!

So, an M & H customer gets more than just a valve. He gets quality control of materials. He gets improved fabrication by modern machinery. He gets the skillful work of craftsmen who are proud of their job.

These are the 3 Ms which have placed M & H products in the forefront of the American valve and hydrant industry.

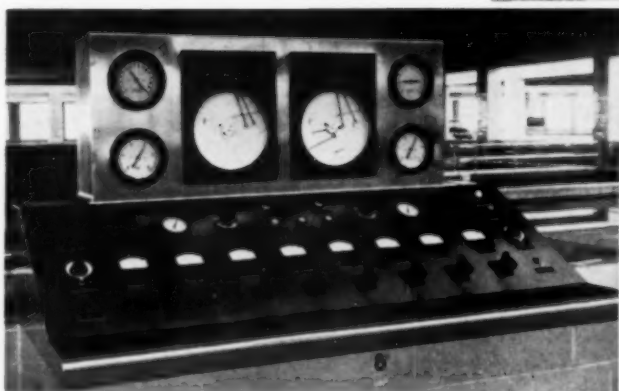
(No. 3 of a Series)

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA



Push-Button OPERATION by LimiTorque

IN THE NEW TORRESDALE
WATER TREATMENT PLANT

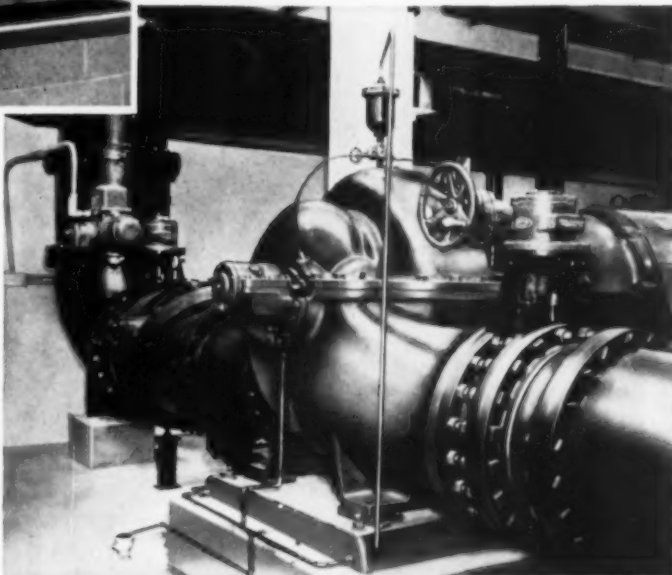


⏏ Twin Filter Console Table used for control of Filters and to control valve sequencing cycle during Filter Backwash—one for each twin filter unit.

LimiTorque Valve Operators play a very important role in the operation of the huge Filter Building at Philadelphia's new Torresdale Water Treatment Plant . . . 94 rapid sand filter beds collectively filter river water at a normal rate of 282 million gallons daily. LimiTorque Push-Button Operators are used to start, stop and reverse automatically, various sized butterfly and gate valves which in turn control valves used in: operating the 94 rapid sand filter beds—and regulating the flow of water in the 54" backwash water header piping—valves installed range from 8" to 42" diameter. A unique feature of this new push-button plant is the use made of limit switch contact points built into the LimiTorque Operator—i.e., the sequence of control for automatic operation of filter beds is through Minneapolis Honeywell Filter Console Tables, using the torque limits (fully opened or closed) to trigger the next valve in sequence—Thus when the employee desires to wash a filter bed automatically, he merely pushes "backwash start" button, and the whole cycle of operation follows.

Most modern Water Treatment and Service Plants have chosen LimiTorque Valve Operators because of their dependable, accurate, trouble-free service, year-in year-out—Thousands are used throughout the world.

For further information about LimiTorque—consult your valve manufacturer, or your nearest LimiTorque Sales-Engineering Office—and remember, there are over 28 years of continuous designing and manufacturing experience back of LimiTorque.



🏠 Looking at 13,900 G.P.M. Wash Water Pump. Right front shows LimiTorque Manual Drive Operator on 24" Butterfly Valve (Pump Suction). Left rear: LimiTorque Valve Operator on 24" Butterfly Valve (Pump Discharge).

THERE IS NO SUBSTITUTE FOR -
LimiTorque®

PHILADELPHIA GEAR CORPORATION
KING OF PRUSSIA (SUBURBAN PHILADELPHIA), PA.
OFFICES IN ALL PRINCIPAL CITIES

INDUSTRIAL GEARS & SPEED REDUCERS
LIMITORQUE VALVE CONTROLS
FLUID AGITATORS • FLEXIBLE COUPLINGS

Limitorque Corporation • King of Prussia, Penna.

"Glass Drainlines for Disposal of Corrosive Wastes," by Edward K. Lofberg. Drainlines made from low expansion borosilicate glass were first installed in a New York City photo-engraving plant in 1939, and their use has increased at a rapid rate since 1954. *Industrial Wastes*, June, 1960.

Streets Beneath The Snow

Streets and avenues for a unique "city beneath the snow" in Greenland are being built with the aid of corrugated steel sheets that serve as roof forms while snow is piled on

top to harden. Then the steel is removed to leave a smooth, permanent roof of snow.

The snow city, known as Camp Century, is being built by the Army on the Greenland Ice Cap some 800 miles from the North Pole. When completed, the sub-snow city will contain houses, laboratories, shops and a hospital. Meteorologists, doctors, communications experts and other scientists will conduct polar research and development programs at the city the year around.

A section of "Main Street" and an interconnecting street have been

completed. The main street is 24 feet deep and 20 feet wide, with walls and roof of snow and ice. The buildings to be constructed will be in interconnecting or lateral tunnels running off the main corridor. The buildings will be insulated, prefabricated shells that can be erected within the chambers hollowed out of the snow.

To form the corridors for Camp Century, the Army uses a Peter snow miller. A series of cuts, each successively lower and wider, provides trench walls much closer at the top than at the bottom. After the corridors have been dug, lengths of steel angles are embedded on either side of the tunnel to form a railing or ledge approximately 18 inches from the top. This ledge serves as support for the roof forms which follow.

The corrugated steel sheets, which are furnished by Republic Steel, are set over the open top of the trench, with the sheet edges resting on the steel railing. A snow plow then blows processed snow over the steel sheets. When this snow hardens, the forms are removed to expose the finished roof. The forms are used over and over again.

Provisions for plumbing and wiring connections in the roof are made by inserting pieces of pipe through holes in the corrugated roof arches before the snow is filled in. When the snow hardens, the pipes are removed, leaving in their place holes of various diameters for the necessary plumbing and electrical equipment.

Construction work on the underground city began in June, 1959, and will be continued this summer. Completion is scheduled for this fall. Camp Century is 138 miles southeast of Camp Tuto, Army polar headquarters. Tuto is in northwestern Greenland, on the edge of the ice cap, 14 miles from Thule Air Base.

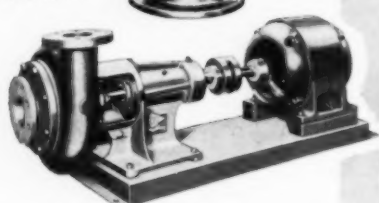
Waste Lagoon Symposium

A Symposium on waste stabilization lagoons will be held at the Continental Hotel, Kansas City, Mo., August 1 to 3. Field trips to observe numerous lagoons in the vicinity of Kansas City and the experimental lagoon at Fayette, Mo., are being arranged for Thursday and Friday immediately following the symposium. The symposium is sponsored by the Missouri Basin Engineering Health Council. Arrangements are being made by Glen J. Hopkins, Regional Engineer, U. S. P. H. S., 2200 Federal Office Bldg., Kansas City, Mo.

A TYPE FOR EVERY SERVICE
RUGGED — DEPENDABLE
NON-CLOG
SEWAGE PUMPS



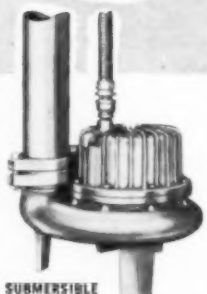
NON-CLOG DRY PIT
pump with double suction elbow and stand. Send for Bulletin 1850.5.



HORIZONTAL NON-CLOG MODEL
with flexible coupling. Send for Bulletin 1850.5.



PACIFIC NON-CLOG PUMP
with motor, motor support bracket, suction elbow and stand. Send for Bulletin 1850.5.



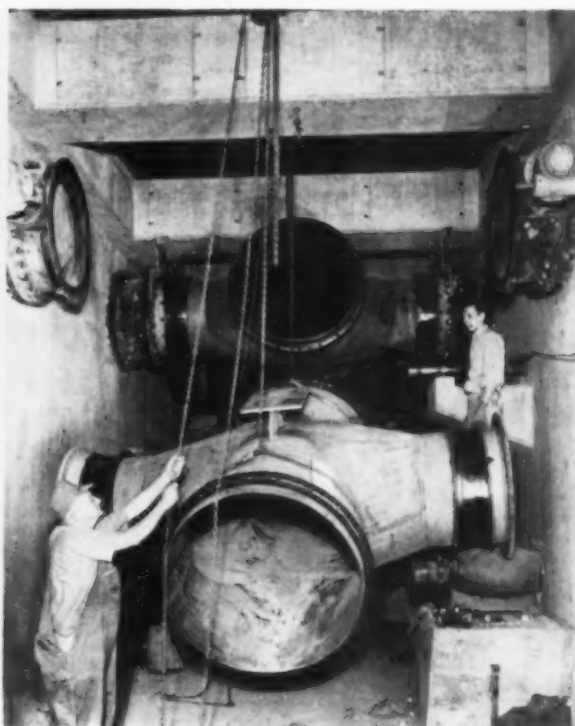
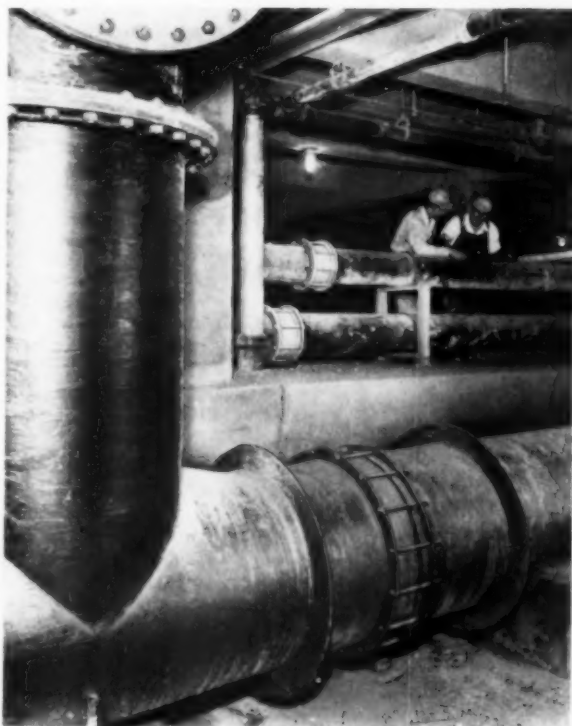
SUBMERSIBLE NON-CLOG
A complete unit ready to install includes pump, motor, automatic controls and cable to control panel. Send for Bulletin 1850.5.

Outstanding performance and long trouble-free service from every type. Pacific Non-Clog Sewage Pumps combine all desirable design features that assure efficient, economical and dependable operation and service.

Order now. ALL TYPES AVAILABLE FOR IMMEDIATE SHIPMENT.


PACIFIC PUMPING CO.
 Established 1907
 Manufacturers and Distributors of Pumps for Every Service
MAIN OFFICE AND FACTORY: 9301 San Leandro St., Oakland 3, Calif.
 OAKLAND, Calif. • Portland, Ore. • Seattle, Wash. • Los Angeles, Calif. • Dallas, Texas

Joining pipe the Dresser way...



Always the easy way...

The 8-inch, 10-inch and 30-inch Dresser-Coupled lines illustrated here are part of the system used in servicing the Clague Road's advanced rapid-sand type filters.

often the only way!

This battery of steel crosses is in the new Clague Road Filtration Plant, designed by Havens and Emerson, Cleveland, Ohio. The Plant will carry a normal flow of 50-million gpd. Contractor: Hunkin-Conkey Construction Company.

Dresser® Couplings provide the essential leeway for bolting up cross flanges to valves in tight spots. They'll take deviation caused by settling concrete and remain bottle-tight . . . permanently! Dresser's vibration-proof properties protect valves and other expensive equipment, and protect the pipelines, too. With a Dresser Coupling, two man-minutes per bolt gives you a permanent, leak-proof joint that absorbs expansion-contraction movement, keeps maintenance problems to a minimum, and makes repairs easier if and when they do become necessary.



DRESSER

MANUFACTURING DIVISION

Bradford, Pennsylvania

Chicago • Houston • New York

S. San Francisco • Toronto & Calgary



DRESSER MANUFACTURING DIVISION

Bradford, Pennsylvania

Please send me my free copy of the Dresser Filtration Catalog, Form No. 158. ☐ If you would also like to receive Dresser's free booklet on Sewage Treatment Plants, please check. ☐

Name: _____

Job Title: _____

Company or City Office: _____

City: _____ Zone: _____ State: _____



● NEW LIGHTS in Emeryville, California, are examined by officials of the city.

Small Community Has

Brightest Street in California

EMERYVILLE, Calif., a small town with big city traffic problems, now has the brightest street lighting system in the state. Wedged between its neighbors, Berkeley and Oakland, this community of 2,800 was plagued by nighttime automobile accidents on San Pablo Avenue, the main thoroughfare which connects the two larger cities.

In 1958 there were four after-dark fatalities and 108 accidents on a half-mile strip of San Pablo Avenue in Emeryville. In Berkeley, on 2.3 miles of the same thoroughfare, there were only 32 accidents and one fatality.

"Since the street lighting on Berkeley's section of the road was about twice as bright as that in Emeryville,

we concluded there must be a connection between bright street lighting and the reduction of after-dark traffic accidents," said Mayor Al J. Lacoste. "We checked and found surveys in many communities proved how effective good street lighting could be in preventing nighttime traffic accidents. In most cases, the number was cut in half."

54 New Luminaires

To light the 75-foot wide, half-mile strip of San Pablo Avenue, Emeryville installed 54 General Electric 1000-watt, 60,000 lumen color-improved mercury vapor luminaires. Mounted at a height of 32 feet on aluminum poles spaced 100 feet opposite, the fixtures provide about nine footcandles of illumination—cr about three times the brightness of any installation in California.

These lights replaced outmoded units installed in 1923. According to City Engineer Julius Lucoff, "These new luminaires direct the light onto the pavement where it will do the most good and provide uniform illumination. Also they are economical since they produce two and a half times as much light per unit of electrical energy than our old units."

Though traffic safety was a major reason behind the city's decision to install the new lights, the hope of attracting people and business was another factor.

The new lighting was installed by Ets-Hokin and Galvan, Electrical Contractors.

What We Do and Do Not Know About CHEMICAL POLLUTANTS in WATER

A report of the Water Supply Committee, Engineering and Sanitation Section, American Public Health Association, presented at the annual meeting of the Association in October, 1959. The members of the Committee headed by Frank L. Woodward, Chairman, were Samuel Baxter, Bernard Berger, Edward J. Cleary, Raymond J. Faust and Joseph A. McCarthy.

UNTIL very recently the extent of water pollution by sewage was measured principally by bacterial concentration and the effects on the oxygen resources of the

stream. Even now the measurement most widely used for determining the efficiency of a sewage treatment process is the biochemical oxygen demand, and the degree of treatment necessary in a particular situation is based mainly on the capacity of the stream to absorb the BOD load of the plant effluent.

Industrial wastes that are of a type susceptible to, or not likely to interfere with, the sewage treatment process are accepted for treatment with domestic sewage, either directly or after suitable pre-treatment. The pollutional effects of other in-

dustrial wastes have been measured largely in terms of oxygen demand, toxicity to aquatic life, tainting of fish, or taste and odor production and other interference with water purification operations.

Persons concerned with water quality management are becoming increasingly aware of the need for establishing new parameters in the measurement of water quality, since present methods do not take into account the vast complex of chemical compounds in waste effluents or entering the water from other sources. It is likely that the next

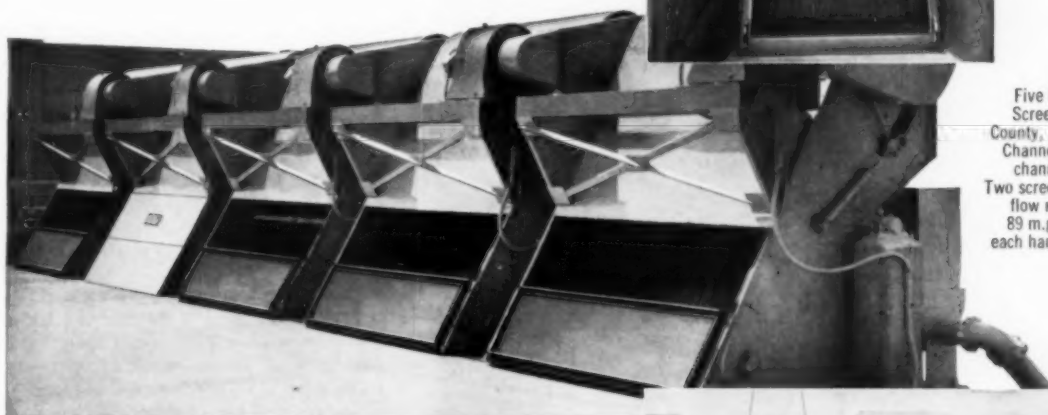
Rex *PIVOTED* Bar Screens

Provide Maximum Flexibility for Los Angeles County Plant

In the Los Angeles County Sanitation District No. 2 Sewage Treatment Plant at Harbor City, a new concept in screening operations has assured a new high in efficiency and flexibility...a new low in operating and maintenance costs...**REX PIVOTED BAR SCREENS.**



Close-up view showing screen suspended in channel. Note neat appearance...totally enclosed, streamlined housing and "straight-through," unobstructed flow.

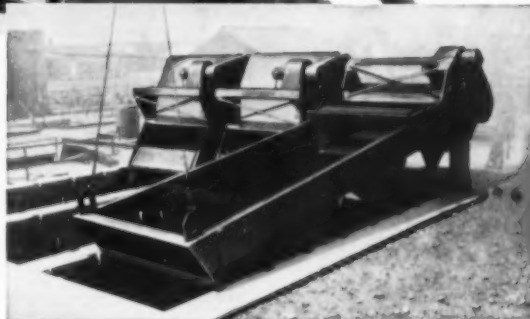


Five Rex PIVOTED Bar Screens at Los Angeles County, Harbor City Plant. Channel width, 6½ feet; channel depth, 16 feet. Two screens each handle a flow ranging from 30 to 89 m.g.d. Three screens each handle flows of 42 to 127 m.g.d.

With this advanced design, each screen is pivoted so that it can be easily swung out of the channel for inspection and servicing. No need to dewater the channel...no need to shut down operations. Screens are back in service in a hurry.

FRONT CLEANING... front-mounted rake is held firmly in place...provides maximum shelf for carrying capacity. Positive, complete cleaning of tops and sides of bars to their full depth. Rakes *and* teeth clean the bars. No chance for rakes to slide over, or miss, screenings. Bar rack is held firmly in place at top and bottom to maintain uniform spacing.

MAXIMUM EFFICIENCY. Full 60-degree inclined racks mean greater rack area exposed to the flow. Dead plate from bar rack to point of discharge eliminates spillage...no screenings on downstream side. Chain Belt Company, 4722 W. Greenfield Ave., Milwaukee 1, Wis.



Screen pivoted out of channel. Pivot shaft rides in heavy-duty angle pillow blocks mounted on concrete pedestals.

REX[®]

CHAIN BELT COMPANY

revision of Drinking Water Standards, now under study, will specify limits on concentrations of substances not considered in previous revisions, many of which were unknown at the time of the 1946 revision.

Basic Considerations

There are certain facts, predictions and assumptions that form the basis for assessing water quality management needs for the present and future.

1) Population. The explosive increase in total population in the

past dozen years is a result of a high birth rate and increased longevity. It is likely that, barring an all-out disaster, the population of the United States will reach 300 million during the lifetime of a sizeable percentage of today's younger people. In the same period there has been an even higher rate of growth of metropolitan areas where, by 1980, 85% of the population will live.

2) Industry. The rate of industrial production since World War II has been about double that of population. The rate of growth of chemi-

cal production has been almost double that of general industry, and production of synthetic organic chemicals has expanded at a rate twice that of general chemical manufacture. It is estimated that the petrochemical industry, which is the source of synthetic fibers, synthetic rubber, plastics, resins, automotive chemicals and a variety of solvents, drugs, fertilizers, etc., will constitute half of the chemical industry by 1965. Chemical wastes have traditionally provided the most perplexing waste problems and, since synthetic chemicals, in general, are relatively new, producing entirely new waste components, this particular area provides the greatest challenge to maintenance of water quality. Industry has become more widely distributed throughout the country for several reasons, including new raw materials sources, availability of water, labor market, economics of transportation, and, possibly, tax climate.

3) Water. The ultimate amount of water available for use has been estimated at somewhere in the neighborhood of 515 billion gallons per day. Present use is approaching 300 billion gallons per day, with the available supply not too well distributed with respect to need. The estimated demand in 1980 is 600 billion gallons per day. Efforts to augment the total water supply by weather modification or desalination have produced encouraging results, but it is unlikely that such measures will be economically feasible for more than limited use for many years. It is evident, then, that the available supply will be subjected to more and more reuse. This means that chemicals that are not removed by waste treatment or water purification processes, or degraded by natural processes in the body of water, will increase in concentration by additions during reuse.

The sources of organic chemicals in water supplies may be classed as:

a) Wastes from industry: These materials run the gamut of industrial production, including wastes from the manufacture of chemicals.

b) Sewage: This includes end products of human and kitchen wastes plus detergents and a myriad of other substances deposited in the sewers from homes, business establishments, and institutions.

c) Land drainage: In addition to the materials generally considered to be drained from barnyards and drained or leached from farmland and forests, present-day land drainage contains insecticides, weedicides,

SAN DIEGO COUNTY chose STEEL PIPE

In 1959 the Second San Diego Aqueduct was constructed for the San Diego County Water Authority. This 30 mile line running over hill and dale, required rugged 76 in. and 73 in. welded steel pipe ranging in wall thickness from 3/8 in. up to and including 1-5/32 in. All pipe was in 32 ft. lengths with a spun mortar lining and an exterior mortar coating.

This 30 mile steel pipe line was laid by Young & Anderson Company, Brea, California.



... every length was hydrostatically tested in the shop to AWWA standards!

STRENGTH
TIGHTNESS
ELASTICITY
ECONOMY
LONG LIFE

...these are inherent qualities of fabricated steel pipe. Compare steel pipe with other types ... you'll see why "wherever water flows, steel pipes it best." You can always specify steel pipe with confidence.

For your copy of the latest steel pipe brochure, write—

STEEL PLATE FABRICATORS ASSOCIATION

105 West Madison Street • Chicago 2, Illinois



MARMAN

Products Simplify Maintenance On All Piping Systems

DISTRIBUTORS

ALABAMA

MILL & MINE SUPPLY CO., INC., Birmingham 4

ARIZONA

HARRIS BEARING & SUPPLY CO., Phoenix

ARKANSAS

BERRY EQUIPMENT CO., Memphis 3

CALIFORNIA

BEARING & EQUIPMENT CO., San Jose
BOLSTAD SALES & SERVICE, San Pedro
GENERAL BEARING CO., Fresno 6
GILMORE SUPPLY CO., San Francisco 3
HOFFMEYER BELTING & SUPPLY, Oakland
NELSON-DUNN, INC., Los Angeles 23
WARREN AND BAILEY, Los Angeles
WARREN AND BAILEY, San Diego
WINN SUPPLY CO., San Diego

CANADA

AEROQUIP (Canada) LTD., Toronto 19, Ontario

COLORADO

MINE AND OIL SUPPLY CO., Grand Junction
PLANT EQUIPMENT CO., Denver 2

CONNECTICUT

NIELSEN HYDRAULIC EQUIP. CO., W. Hartford

ILLINOIS

APEX POWER EQUIPMENT CO., Chicago 23
ILLINOIS AUTO ELECTRIC CO., Chicago 16
MIDSTATE MACHINERY CO., Decatur
TRANSMISSION SUPPLY CO., Peoria
TRANSMISSION SUPPLY CO., Rock Island

INDIANA

BRIGGS DISTRIBUTING CO., INC., Indianapolis 2
TRANSMISSION SUPPLY CO., Indianapolis

IOWA

COHN BROS., INC., Waterloo

KENTUCKY

BERRY EQUIPMENT CO., Memphis 3

MASSACHUSETTS

GENALCO, INC., Needham Hts. 94

MICHIGAN

UTILITY & INDL. SUPPLY CO., Jackson
F. B. WRIGHT CO., Dearborn

MINNESOTA

POWER BRAKE & EQUIPMENT, INC., St. Paul 14

MISSISSIPPI

BERRY EQUIPMENT CO., Memphis 3

NEBRASKA

ENGINEERED SALES CO., Omaha

NEVADA

STANDARD WHOLESALE SUPPLY CO., Las Vegas

NEW JERSEY

GOODYEAR RUBBER PRODUCTS CORP.,
Newark 2

NEW MEXICO

EQUIPMENT SALES & MFG. CO., Albuquerque

NEW YORK

NIELSEN HYDRAULIC EQUIP., Pelham Manor
CLARK WITBECK, Schenectady 1
ENGINE EQUIP. SERVICE, New York 61
POWER DRIVES, INC., Buffalo 20

NORTH CAROLINA

CROSS SALES & ENGR. CO., Greensboro

OHIO

BURR OAK BELTING & RUBBER CO., Cincinnati 14
M.F. MURDOCK CO., Akron
UTILITY & INDL. SUPPLY CO., Lima

OREGON

GOODYEAR RUBBER & SUPPLY, Portland 9

PENNSYLVANIA

CYPHER COMPANY, Pittsburgh 6
RONCO CORPORATION, Blue Bell (sub. of Phil.)

TENNESSEE

BERRY EQUIPMENT CO., Memphis 3

TEXAS

W. H. STEIGERWALD CO., INC., Houston 3

WASHINGTON

TOWNE EQUIPMENT CO., Spokane 1

WISCONSIN

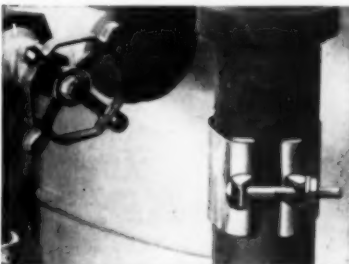
A-C SUPPLY CO., INC., Green Bay
A-C SUPPLY CO., INC., Milwaukee



HEAVY-DUTY PATCHMASTER REPAIRS PIPE LEAKS QUICKLY AND INEXPENSIVELY

Repair all high-pressure pipe leaks quickly, safely with this new Heavy-Duty PATCHMASTER. It's designed to conform to pipe under high torque—without biting into the pipe! Flexible stainless steel band is completely corrosion resistant. The synthetic rubber pad won't extrude or deteriorate and adapts the PATCHMASTER to oil, gas, water and steam piping in all industries. Cut costly equipment downtime. Have Marman PATCHMASTERS on hand. Sizes for 1/2" to 8" pipe.

For complete information on these and other versatile Marman Products, contact your local Marman distributor listed here.



Emergency temporary repair of pipe leaks can be made with ease, yet the PATCHMASTER will stop leaks permanently.



BAND CLAMP WITH FLAG IDENTIFIES LINES OR INSTRUCTS

The Marman Universal Band Clamp with Flag Attachment provides easy identification of pipe lines or carries instructions to avoid costly mistakes and delays. Made of non-corrosive steel with a stainless steel flag to display warnings or instructions, it is quickly installed on any pipe, tube or pole. Available in four sizes to fit pipe diameters ranging from 2 1/4" to 16 1/4".



A Universal Band Clamp is quickly attached to a flag pipe elbow for identification in an oil refinery.

PATCHMASTER is an Aeroquip Trademark.

Aeroquip

MARMAN DIVISION

11214 EXPOSITION BLVD., LOS ANGELES, CALIFORNIA
IN CANADA: AEROQUIP (CANADA) LTD., TORONTO 19, ONTARIO
Marman Products are Covered by U.S. and Foreign Patents and Other Patents Pending

synthetic fertilizers, seed treatment chemicals, and rodenticides.

d) Materials deliberately placed in water: These include chemicals used for vegetation control or for control of fish in reservoirs, and the chemicals used in water purification.

Toxicity

The primary concern regarding the effects of organic chemicals must be their toxicity. Some of the chemicals are known to be or suspected of being carcinogenics, but the limits of tolerance in drinking water are not known. Some hematologists suspect that leukemia and other blood

conditions may be more common in some areas than others because of a higher content of organic chemicals in the water. Several studies on toxicity have been carried out, including those of the Robert A. Taft Sanitary Engineering Center of the U.S. Public Health Service and the Ohio River Valley Water Sanitation Commission—Kettering Project, but the problem needs much more exploration to determine effects of long-time human ingestion of very low level concentrations. The finding that a new chlorinated hydrocarbon insecticide can kill fish in a concentration of less than 1 part

per billion is a sign post pointing to serious possibilities in this area.

The fact that records do not reveal any human illness involving synthetic organic substances in a public water supply does not give any assurance for the future, since it must be assumed that there is a limit to human tolerance to those materials, even in dilute concentration. Perhaps this limit has already been reached in some areas with respect to certain substances, without symptoms having been recognized. A careful comparison of health statistics in selected areas might reveal signs that have been overlooked. This situation is analogous to that of air pollution but it should be less difficult to resolve since water pollution has better defined dimensions than has air pollution. On the other hand, ground water pollution could be much more permanent.

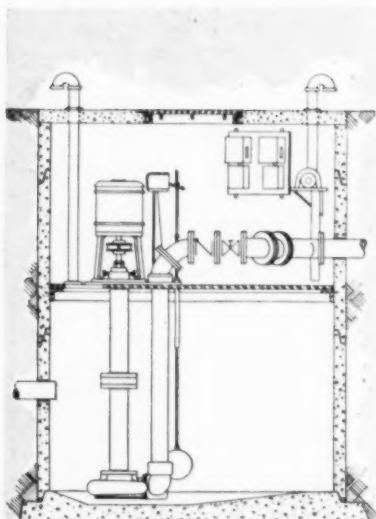
Algae may be considered a by-product of pollution by organic chemicals. It has been suspected that decomposition products of heavy algal growths may have been related to the high incidence of gastrointestinal disturbances in certain communities using Ohio River water during the 1930-31 drought on the Ohio River. The occasional reports of losses of livestock and aquatic animals, as a result of poisoning by certain toxic algae, give reason to speculate that this may sometime involve human life.

In the opinion of members of the committee, regulatory authorities have been supine in dealing with the problem of toxicity of industrial wastes. It is contended that responsibility for providing information on the toxic properties and permissible concentrations of a waste discharge should be made the burden of the producer of the waste, and not until the producer has provided adequate data that is satisfactory for appraisal by the regulatory authorities should a permit for discharge be issued. The arguments are: 1) It can no longer be considered the public burden to prove the toxicity or non-toxicity of whatever anyone chooses to discharge into public waters; 2) even if regulatory agencies had financial resources and personnel many times greater than they now, or probably ever will, possess, they could hardly cope with the testing of the multitudinous existing and new products that are being discharged into surface streams. To support this thesis the experience of the Food and Drug Administration is cited. This agency could not

AUTOMATIC

UNDERGROUND LIFT STATION

with the **weil** HEAVY DUTY Vertical Screenless Sewage Pumps



For complete specifications ask for Bulletin C-900. Weil Engineers are always available to provide technical information for your special applications.

When sewage or drainage water cannot drain by gravity to the main trunk sewer or treatment plant an automatic lift station is required. Illustrated at the left is the most economical installation to build employing the submerged style vertical ejector in the wet pit.

The motor is totally enclosed and equipped with a water-tite conduit box. Float switch, starters, alternator (for duplex units), and disconnect switches are all NEMA-4 water-tite.

The piping is simple and economical. Gate valves may be omitted if necessary. A check valve should be used in each horizontal discharge pipe.

Pit may be constructed of concrete tile. Pit may be as small as 84" diameter. A cover separates the wet pit and the motor room at top and an atmospheric vent pipe runs from wet pit to a point above ground. A ventilating blower may be installed for the upper section of the pit.



This **NON-CLOG** Impeller built into the **WEIL** Sewage Pump supplies the ideal method of pumping sewage and unscreened liquids containing solids.

weil PUMP COMPANY

1526A N. FREMONT ST. CHICAGO 22, ILLINOIS

adequately carry out its task of protecting the public from the adverse effects of food additives because the burden of proving deleterious effects rested entirely upon the agency. Now the law has been changed to place the burden where it logically belongs—the producer.

Persistence

Many of the chemicals are known to be highly persistent in water solution. Moreover, they appear not to be materially reduced by conventional water purification methods. Much has been written about the problems created by the surface acting components of synthetic detergents in sewage treatment plants, water purification plants and cooling towers, as well as about their increasing in concentration upon water reuse. It is likely that if these components did not foam at low concentrations of approximately one part per million, their presence might go unnoticed, since they apparently do not greatly affect the operation of sewage treatment plants and do not cause tastes and odors or interfere with water purification at concentrations occurring normally. They do not respond to plain sedimentation but are reduced by activated sludge treatment. This is not necessarily true of other synthetic organics.

Recent disclosures that detergents have been found to travel distances up to several hundred feet, through soils that have been considered suitable for disposal of sewage by absorption, suggest the use of surfactants as a positive indicator of the presence of sewage, since such material does not appear naturally in water, as is the case with other sewage constituents such as nitrate. Incidentally, the appearance of detergent suds in water is much more convincing proof to a homeowner, in a development relying on individual wells and septic tank systems, that his drinking water is contaminated by sewage than is a report that coliform organisms are present. Thus far the detergent phenomenon has been reported in well waters from relatively shallow formations, but there is no reason to doubt that deeper strata will ultimately be affected by this and other chemicals. This raises a serious question regarding the wisdom of attempting to recharge deeper aquifers with sewage effluents or with water polluted by chemicals. It also suggests that insecticides, rodenticides and agricultural chemicals may cause concern by appearing in

YOUR CHOICE OF 3 TELEMETERING SYSTEMS

Remote Supervisory Controls designed and manufactured by Healy-Ruff Company are easy to supply—simple to use. Control only, or recording and indicating as well can be supplied. All systems incorporate these desirable features:

- Receiver can be any distance from transmitter
- Only one pair of wires is required
- 48 volt D.C. signal is used for lowest telephone line charges
- Heavy-duty mercury switches permit direct operation of motor starters

The RTM provides multi-circuit control, up to 8 circuits over one pair of wires with single receiver. Transmitter can be pressure or float-operated. A D.C. signal in direct proportion to the pressure air level being sensed is transmitted, using proven time-impulse principle. Receiver can be furnished with recorder and indicator.

The Bi-trol controls two pumps over one pair of wires. First signal operates one pump—second signal operates other pump. An alternator can be supplied to equalize pump wear.

The Uni-trol controls a single pump. Type TAE is available with a return signal, to indicate the pump has started.

Write for Bulletins RTM and SC



HEALY-RUFF COMPANY

791 Hampden Avenue • St. Paul 14, Minn.

First in dependable controls for waterworks and sewage—since 1929

Remote supervisory controls • Complete system controls • Elevated tank controls • Sump controls • Hydropneumatic tank controls • Float controls • Alternators • Alarm silencers • Protective devices

WARN HUBS
on your 4-wheel drive
stop front end drag
in 2-wheel drive!

Models for
all makes
of 4 w. ds.
to 1½ tons
at dealers.
Write for
literature.

KEY EQUIPMENT ON PUBLIC WORKS TRUCKS!

Four-wheel drives, Warn Hubs and public works go together like bolts and nuts. Off the road, a 4-wheel drive goes almost anywhere a dozer goes, to keep equipment serviced. On the highway, free-wheeling 2-wheel drive with Warn Hubs stops front end drag, saves gas, gears, tires, improves steering, performance. Choose Warn Lock-O-Matics or fingertip control Locking Hubs to fit your needs. Guaranteed. Ask your dealer.

WARN MFG. CO., INC.

PROVEN IN OVER A
BILLION MILES
OF USE UNDER
ALL CONDITIONS!

Riverton Box 6064-P
Seattle 88, Washington



ground water as well as in surface water.

Composition

Assessment of the effects of the chemical complex on water uses requires at least partial identification of the components. Such identification is necessary for determination of sources and for the direction of efforts to reduce or control the output of soluble organics. Limited work in this area by the Taft Sanitary Engineering Center reveals a startling lack of available tools for the purpose. A study of data from an activated sludge effluent indi-

cated that it contained approximately 150 ppm of soluble organics, of which only 7 ppm, the alky benzene sulfonate, could be identified with assurance. In another study of an effluent from an experimental activated sludge unit about 30 ppm of soluble organics was found, of which 7.5 ppm could be identified by category. The identification of even this 25 percent was not sufficiently specific to serve the needs of determining sources and predicting effects.

The objective of "complete" treatment of sewage has been the attainment of the highest possible de-

gree of oxidation of the effluent. Yet the nitrates and phosphates in such effluent have a fertilizing effect on algae, raising a question as to the overall accomplishment, at least in the minds of the people who have financed the improvement. Efforts to develop methods for economical reduction of nitrates and phosphates have not provided a solution to this problem, which may be expected to increase as dilution factors decrease.

Owing to the fact that the organic chemicals in water usually occur in very low concentrations, conventional methods of recovery and identification are inapplicable or not available. Accordingly, the Taft Sanitary Engineering Center has utilized the adsorptive properties of activated carbon in development of a filter technique which is capable of adsorbing most of the chemicals. By concentrating the chemicals from large volumes of water and extracting the substances by use of organic solvents the materials can be classified according to the solvent used. The residue, after distillation to remove the solvent, is subjected to analysis. While this and other methods of separation may provide a starting point, identifications are not complete and much more study is needed to determine origin of the components and their effects, both singly and in combination, on water use.

Conclusions

There is need for extensive research on toxicity and other effects of chemical contaminants and on methods for detection and identification. Many random studies have been and are being carried on for specific purposes, but the committee is of the opinion that to be effective research projects should be coordinated by a single agency or organization, and definite assignments made for particular phases of the problem, with funds made available by federal and industry grants. It is suggested that the Public Health Service is the proper agency for this coordination.

The committee feels that further study of this matter might well be carried on by the Engineering and Sanitation Section after the Drinking Water Standards have been revised and a report made by the Water Quality Committee of the American Water Works Association. By that time improved analytical methods should be available and some of the coordinated research recommended herein may be completed.

NEW MINIATURIZED WILKINSON LINE LOCATOR

Radically new, powerful, transistorized locating instrument weighs only 4 lbs. and is $\frac{1}{4}$ as large as old type pipe locators.

Telescoping aluminum handle; 2 oz. single ear set; all in carrying case.

Write today for brochure and instruction manual.

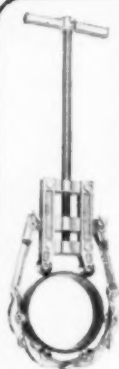


MODEL W-3

WILKINSON PRODUCTS COMPANY

3987 Chevy Chase Dr., Pasadena 3, Calif.

SYlvan 0-4314



**Ellis Heavy
Duty Pipe
Cutters For
Pipe Up
To 16" Dia.**

With Long
Lasting Cutter Wheels

Designed for water works men who appreciate the rugged construction of drop-forged frame and links; and a tool that assures no pipe breakage, no re-cutting and no spoilage.

THREE SIZES

No. 01 for 4" to 8" Pipe

No. 1 for 4" to 12" Pipe

No. 1B for 4" to 16" Pipe

write today for free literature

ELLIS & FORD MFG. CO.

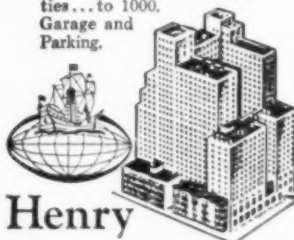
1100 COOLIDGE RD.
BIRMINGHAM, MICH.

WELCOME!

Public Works Congress
and Equipment Show
Conventioneers
to your meeting
at the Coliseum
AUGUST 14-17, 1960

Headquarter at the
Henry Hudson Hotel

In the heart of New York City
—58 steps from Coliseum. Near
all activities & transportation
terminals. Swimming Pool
available to guests. Entertainment
Nightly in Voyager
Room. Superb Meeting Facilities
...to 1000.
Garage and
Parking.



**Henry
Hudson Hotel**

332 West 57th Street, New York 19
Columbus 5-6100

NEW YORK CITY

Microstraining For the Denver Water Board

The Denver Water Board, Colorado, in May, 1958, purchased a 7½ by 5-ft. diameter Microstraining unit to carry out tests on treatment of water from the Marston Lake Reservoir. The tests proved to the satisfaction of the Board's engineers that the process removes over 90 percent of the micro-organisms commonly present in this water.

Following the results of the test period, the Board instructed their Consulting Engineers, Phillips-Carter-Osborn, Inc., to design a Microstraining installation which could be constructed in increments, with a final capacity of 120 million gallons per day. The first section of 60 mgd capacity is to be completed by April, 1961. This will use twelve 10-ft. by 10-ft. diameter Microstrainers.

The machines consist of revolving drums covered with woven stainless steel fabric having apertures as fine as 23 microns. Micro-organisms and suspended matter in the water are deposited on the inside of the drum as the water passes through, then are washed off by jet sprays and discharged to a waste hopper. Expansion of the plant will be undertaken as the demand for water increases thereby taking advantage of the flexibility of the process which enables additions to be carried out quickly at any time. When complete, the installation will treat the greatest volume to date of any of the 120 Glenfield plants scattered throughout the world; 20 such plants are in operation in North America. The Denver units were supplied by Glenfield & Kennedy, Inc., 275 Halstead Avenue, Harrison, New York, of which George R. Evans is Vice President.

Research in Water Supply Prediction—A Correction

In the second paragraph of Edward Wiser's article on Research in Water Supply Prediction (July, PUBLIC WORKS, page 90) two lines were omitted: Following the words "However, general applicability" there should be inserted "is limited because most data are obtained on relatively large . . ." The final text will then read, starting with the second sentence of the second paragraph: "However, general applicability is limited because most data are obtained on relatively large watersheds and many of the gauges have insufficient length of record to be statistically reliable."

PUBLIC WORKS for August, 1960

THE LELY FERTILIZER DISTRIBUTOR AND SEEDER

An outstanding success for the maintenance of turf as in parks, playgrounds, highway roadsides, golf courses, airports and other seeded areas.



Two types to choose from:

- 3 point hitch machine (as shown)
- Pull type wheel driven machine

Check the following features:

- High quality machine
- Spreading width up to 50 ft.
- Spreading angle can be varied from rear spreading to side delivery (important on highway roadsides).
- Very easy to clean as hopper can be detached by quick release
- High accuracy of fertilizer distribution
- Big hopper capacity and a spreading disk of special design

LELY

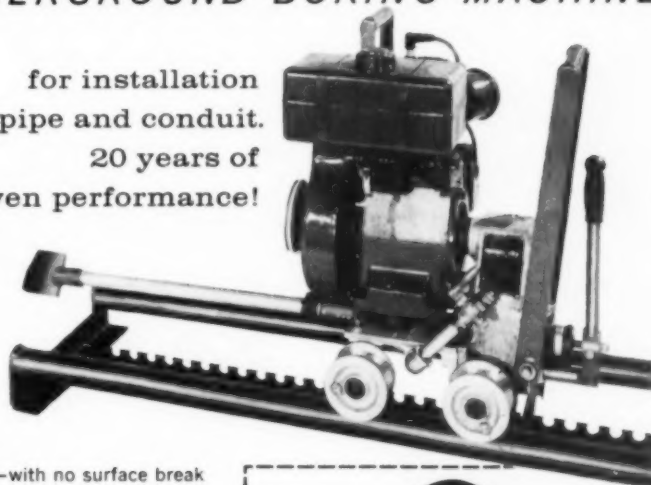
Stock of machines available in the United States and Canada. Write today for complete information to

Ltd.

2133 Paisley Ave., Burlington (Ontario), Canada
(Distributors and Dealers: Some territories are still available)

EARTHWORM UNDERGROUND BORING MACHINE

for installation
of pipe and conduit.
20 years of
proven performance!



- BORES—with no surface break
- BORES—up to 250 feet in length
- BORES—up to six inches diameter
- BORES—so drill stem of pipe of conduit stays
- BORES—500 feet on 1 Gal. of gas
- REAMS—up to 12 inches diameter

Write for Bulletin

EBMI

EARTHWORM BORING MACHINE, INC.

P.O. BOX 1100 • 1415 14TH STREET
SANTA MONICA, CALIFORNIA

DREDGING PROJECTS



● DREDGING, in many locations, with proper planning, can convert swampy and semi-submerged areas into attractive and desirable beaches, play areas or marinas.

Boost County Development Program

EACH YEAR, thousands of tons of sand, silt and gravel are eroded by tidal and weather action and settle at the bottom of Long Island's channels and bays. These waters then become clogged. The necessity of keeping them free and clear has been a constant problem to Suffolk County officials.

To solve it, Suffolk County in 1956 contracted for the purchase of a 12-in. (diameter of discharge pipe) heavy-duty hydraulic pipeline dredge with the Ellicott Machine Corp. of Baltimore, Maryland. The new dredge, christened "Shinnecock," was put to work on various channel clearance projects in September of that year.

Since then, possession of the dredge has given a tremendous boost to public works developments in the County. Its availability has created a widespread demand for the completion of certain projects, and each township has requested

use of the dredge for a number of jobs.

County officials report that the dredge has made possible the completion of 22 different projects, primarily marina development, beach fill and dredging channels. Through December of last year, 3,665 cubic yards of materials had been dredged.

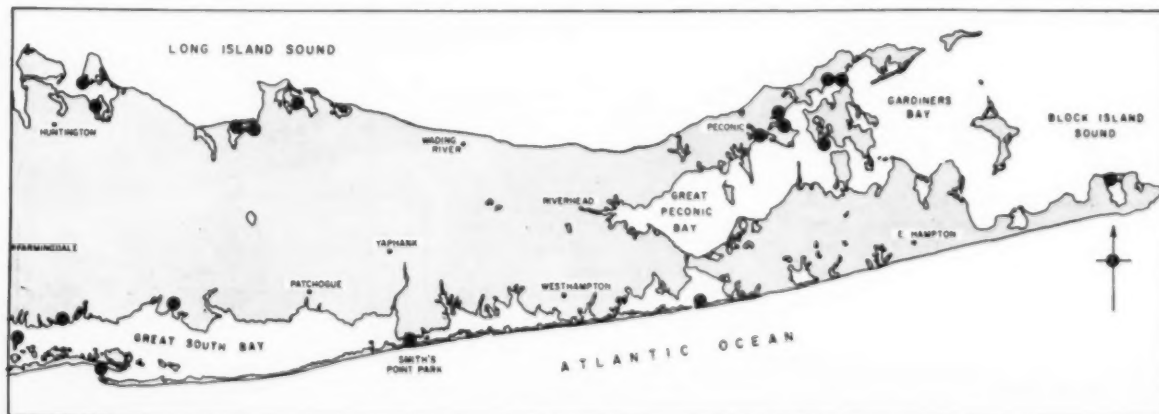
The dredge has worked 24 hours a day, five days a week during all this time, with Saturday set aside for any necessary repairs. It has been reported by Albert Cass, Commissioner of Public Works for Suffolk County, that there has been no serious downtime since the dredge went into operation.

Operational cost has averaged, over the past three years, approximately 35 cents per cubic yard, a figure that includes all costs relating to the dredge, such as amortization of equipment, labor charges and replacement of spare parts.

"Many thousands of dollars have been saved by the County doing its own dredging", Mr. Cass declares. Such savings have meant for the County a steady return on its dredge investment in terms of work accomplished. It is doubtful that this amount of work could have been performed in the same period if the County-owned dredge were not on hand.

Smith's Point Park Project

The Shinnecock's major job has been the creation of Smith's Point Park on Long Island Sound between Narrow Bay and the Atlantic Ocean. As a result of the dredging operation, this once swampy, pitted, half-submerged finger of land has become one of the New York area's most beautiful beaches. Joined to the mainland by a newly-built bridge, it is expected to receive thousands of shore-bound vacationists this summer and will offer a



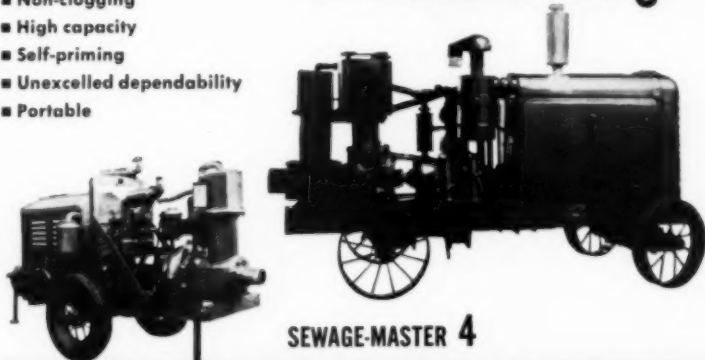
● DOTS ON THE MAP of eastern portion of Long Island show where Suffolk County has employed dredging to advantage.

- If you**
- Repair or rehabilitate your own sewer lines
 - Do your own contract work that requires wellpoint dewatering
 - Have to pump water in maintenance or emergency work

Here's ONE pump for all 3 jobs

- Handles 3" solids
- Non-clogging
- High capacity
- Self-priming
- Unexcelled dependability
- Portable

The SEWAGE-MASTER 6



SEWAGE-MASTER 4

■ Repairing and rehabilitating sewer lines

The Sewage-Master trash pump is a ruggedly built unit specially designed for municipal and construction work where raw sewage and liquids containing large solids and stringy material must be handled. Rags, rope and other fibrous materials pass through the pump without winding around the impeller. The discharge valve is designed without cage or rods, thus preventing any build-up of solids in the valve body.

■ Wellpoint dewatering

The Sewage-Master has all the features of a wellpoint pump, too. A high-capacity vacuum pump and compact air separation tank insure fast, continuous priming. The Sewage-Master 6, a 6" unit, is powered by a GM 3-cylinder diesel for around-the-clock trouble-free pumping, day after day. The Sewage-Master 4, a 4" unit, is equipped with a Hercules, 3-cylinder diesel unit, powered to permit continuous pumping without fear of break-down.

■ Emergency water pumping

Still another feature of this versatile pump is its usefulness as a sump for routine or emergency water removal. As a sump pump, the Sewage-Master 6 offers 75% greater pumping capacity over conventional pumps, size for size.

Use the Sewage-Master as a lift station or plant stand-by pump, as a line bypass pump, as a wellpoint dewatering pump or as a sump pump. You cannot find a pump that can do so many jobs, so well. For more information and a data sheet with performance specifications, write to one of the offices below. Available for rental or sale. Ask about our time payment financing plan designed for municipal purchasing.

FOUNDATION WELLPOINT CORPORATION

Long Island City, N. Y.
38th Ave. & 10th St.

Ft. Pierce, Fla.
P.O. Box 2133, Station A

Chicago, Ill.
2608 W. 111th St.

See the Sewage-Master pump at the 1960
Public Works Congress and Equipment Show
BOOTH A-47



STOP! and see

MICHELIN

Steel Cord Tires

at the **PUBLIC WORKS CONGRESS
AND EQUIPMENT SHOW**

New York Coliseum August 14-17, 1960

We'll be at **BOOTH A-48** . . . ready to give you full details on MICHELIN "METALIC" 4-PLY STEEL CORD TIRES.

- "METALIC" STEEL CORD TIRES for construction work, refuse removal, etc.
- "X"-1-PLY STEEL CORD TIRES for low-bed trailers.
- "X"-SAHARA 1-PLY STEEL CORD TIRES for heavy-duty operations in desert areas.
- "XR"-1-PLY STEEL CORD TIRES for earthmoving equipment.

MICHELIN TIRE CORP., 26-15 Brooklyn-Queens Expressway West, Woodside 77, New York

bathing beach, bath houses, restaurants and parking facilities for 3,400 cars.

The "face-lift" was a swift operation. Channel dredging and land fill were completed in five months of round-the-clock operation. In all, nearly one million cubic yards of fill were deposited on the park area. The 512-acre site consisted of 273 upland acres and 239 underwater. These latter have been dredged and the fill deposited on the park area, giving it a level height of seven feet at mean sea level on the bay side and 17 feet on the ocean side.

Other projects include rebuilding 5,000 linear feet of dunes east of the Shinnecock Bay inlet to avert undermining of a \$1,000,000 jetty. For this, 344,000 cubic yards of silt was pumped into the dune area from a channel dredged 12 ft. deep, 6,500 ft. long and 200 ft. wide. After this, the south approach to Smith's Point Bridge was rebuilt. In just six weeks, 252,000 cubic yards of sand were relocated in that particular area. Successive projects at Oak Beach, Amityville, Copiague and Champlain resulted in safe channels and improved facilities for small boat navigation.

Report on Federal-Aid Highway Program

More than one-fifth of the National System of Interstate and Defense Highways is now open to traffic—8,855 miles of the 41,000-mile goal. The status of progress as of March 31, 1960, was compiled by the Bureau of Public Roads, U. S. Department of Commerce, from reports received from its field offices in each State.

The Interstate System will be the Nation's basic trunk highway network, serving both civilian and defense requirements and carrying about 20 percent of the total traffic. The Federal-Aid Highway Act of 1956 required the System to be designed to accommodate the traffic needs of 1975 and assumed the completion of the System by 1972.

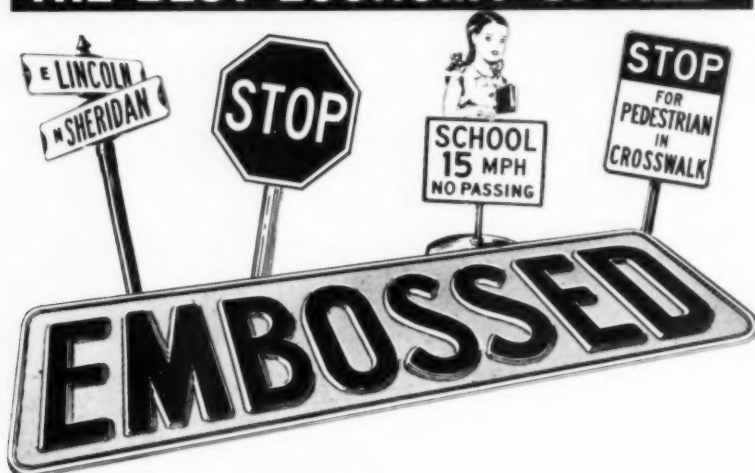
Of the 8,855 miles of the Interstate System now in use by motorists, 3,442 miles were completed to standards adequate for 1975 traffic, and 3,139 miles were improved to adequacy for present traffic but will need additional improvement to bring them up to the standards for 1975. Toll roads, bridges, and tunnels incorporated in the system, as permitted by law, totaled 2,274 miles.

Almost half of the mileage open to traffic, 4,114 miles, has been built or improved under the Federal-aid Interstate program, most of it on the 90-percent Federal, 10-percent State sharing program launched in 1956. Work on the remaining 2,467 miles was financed by the States and localities, mostly before 1956, under other programs—in many cases with Federal aid.

In addition to the sections open to traffic, 4,353 miles were under construction with Interstate funds as of March 31, and engineering or right-of-way acquisition was in progress on another 10,436 miles. Thus some form of work was underway or completed on 23,644 miles of the 41,000-mile system—over half of the total.

The mileage of the Interstate System improved and open to traffic has risen from 7,570 to 8,855 since January 1 of this year, an increase of 1,285 miles. Under the controlling legislation, each State receives a yearly apportionment of Federal Interstate funds for work on approved Interstate System routes. The scheduling of preliminary steps and actual construction on these routes is left to the States, subject to approval by the Bureau of Public Roads.

THE BEST ECONOMY OF ALL—



MIRO-FLEX TRAFFIC CONTROL SIGNS

Miro-Flex easy-to-see embossed signs — give extra safety, when safety counts! Embossed design and raised letters add extra strength and rigidity for years of rugged service — outlast ordinary flat-surface signs by far! Miro-Flex quality finish is baked on to stay — stands up in any kind of weather. And, raised letters are easier to read — in Miro-Flex street name assemblies, traffic control, and signs of all types. Street name assemblies are available in rust-proof steel or aluminum. So choose Miro-Flex signs, for easier readability and longer service — to give extra safety, when safety counts! Write for free Miro-Flex catalog of quality street name assemblies and traffic control signs, today!

The **MIRO-FLEX** CO., INC.

1824 EAST SECOND WICHITA 14, KANSAS

Standard Traffic Signs Available for Immediate Delivery at Northeastern Warehouse
Kootz Equipment Corporation, 325 Ohio River Blvd., Emsworth, Pittsburgh 2, Pa.

NEWS OF ENGINEERS

ERNEST R. ROTH, who has been in charge of the industrial wastes engineering section of the Atlantic Refining Co., has joined Roy F. Weston, Inc., consulting engineers of Newtown Square, Pa. He will be in charge of air pollution activities.

H. S. SMITH has withdrawn as a partner of Stanley Engineering Company, Muscatine, Iowa, and Chicago, Ill., for graduate work and research at the State University of Iowa, to be followed by teaching.

DALLACE W. OGILVIE has been made Assistant Engineer-Manager of the Alameda Co. (Calif.) Flood Control and Water Conservation District. He was previously Chief of the Construction and Maintenance Branch and acting as Assistant Engineer-Manager.

ROSS H. WALKER of Richmond, Va., is the new chairman of the Ohio River Valley Water Sanitation Commission. Mr. Walker has been a commissioner since the agency was established in 1948 and is also a member of the Virginia State Water Control Board.

HARRY C. PLUMMER, director of Engineering & Technology for the Structural Clay Products Institute, has received the Award of Merit of the ASTM in recognition of his long-time constructive participation in the work of that society.

HARRY H. KIRCHMAN, recently Director of Public Works and City Engineering for Fridley, Minn., has opened an office for Commercial and Industrial Development at 4548 Stevens Ave., Minneapolis 9, Minn. He will specialize in business relocations, land sites, building engineering design and construction and financing.

• • •

Man Experienced in Municipal Operations

A man experienced in city management operations, direction of public works and power and lighting is available. Full statement of experience will be sent on request. Write Box R8, Public Works Magazine, 200 So. Broad St., Ridgewood, N. J.



Speed

LINE PAINTING
through more efficient
traffic control with...

SAFE-T-CONE TRAFFIC GUIDES

All-rubber SAFE-T-CONES

available
in 3 sizes
28-Inch
18-Inch
12-Inch



Adaptors for signs, flasher-lights
and flags convert ordinary SAFE-
T-CONES to special purposes.

**SAFE-T-CONES are used coast-to-coast
to solve modern traffic problems!**

SAFE-T-CONES are proven and accepted by Federal, State and Municipal Traffic Authorities in hundreds of major cities. SAFE-T-CONES command attention wherever used. Ease-of-handling makes them adaptable to all situations at a moment's notice.

NEW, solid-color PVC* POLY-CONE available!

Colored Poly-vinyl-chloride outlasts
ordinary cones without upkeep!

Write us for full information
RADIATOR SPECIALTY CO.
CHARLOTTE, N. C.



Atlantic City's Newest Convention Hotel

The Jefferson with its new facilities for handling all convention groups is fast becoming Atlantic City's most popular convention hotel.

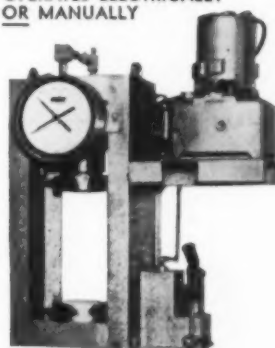
The Jefferson features an abundance of Meeting, Banquet and Exhibition Rooms fully equipped to handle your every need. Experienced personnel. Location ideal in heart of Atlantic City.

WRITE • PHONE • WIRE TODAY
FOR DESCRIPTIVE LITERATURE

Convention Manager
Hotel Jefferson
Atlantic City, N. J.

FORNEY JOB-SITE CONCRETE TESTER FT 20-E

- CONFORMS TO
ASTM STANDARDS
- OPERATES ELECTRICALLY
OR MANUALLY



- PERMANENTLY MOUNTED
ELECTRIC PUMP
- 250,000 LB. LOAD RATING FOR
CYLINDERS, CORES, BLOCKS,
BEAMS, CUBES, BRICK AND
DRAIN TILES

FORNEY'S, INC.
TESTER DIVISION • BOX 310
NEW CASTLE, PA., U. S. A.

Municipal Power

VOLTAGE LEVELS on Electric Distribution Systems

BRUCE J. ENNIS

Principal Engineer,
Burns & McDonnell Engineering Co.,
Kansas City, Missouri

THE VOLTAGE levels at which the various components of an electrical distribution system must be operated depend on the maintenance of a satisfactory range or spread of voltage at each consumer's point of utilization. It is impossible, economically, to maintain an absolutely flat voltage level throughout the system wherein each consumer would be supplied with a constant and equal voltage; however, by proper design and with the use of suitable voltage regulating equipment, a distribution system may be operated to minimize the voltage

Table 1—Normal Operating Voltages for Satisfactory Service

Nominal Utilization Voltage Group	Group Voltage Range	Maximum Variation For Individual Consumers
120	114-126	6
240	228-252	12
208	198-218	10
480	456-504	24

spreads between utilization points and to maintain an acceptable range between maximum and minimum permissible voltages at each consumer's meter. No two systems are identical in the design of distribution circuits and the use of regulating equipment, so it is difficult to generalize with regard to specific values of acceptable utilization voltage variations for an individual

system. As a reference guide, however, voltages which should produce satisfactory service under normal operating conditions are listed in Table 1.

In this table, preferred nominal system voltages are considered to be 120, 120/240, 120/208 Y, and 277/480 Y volts; variations in these voltages do not exceed 5 percent plus or minus for consumers as a group; and

BUILT TO "take it"

WAUSAU PRODUCTS

The WORLD'S MOST COMPLETE LINE of SNOW REMOVAL EQUIPMENT!

Now Introducing the REVOLUTIONARY **NEW EXPRESSWAY**

- Wausau Snow Plows - Vee and Blade
- Wausau Snow Wings
- Wausau Underbody Truck-grader Ice Blade
- Wausau Sno-Thru Loader and Thrower
- Wausau Material Spreaders
- Write for full details on all Wausau Products... Literature available on every item.



The WAUSAU EXPRESSWAY snow plow is a high speed power reversible blade plow designed for today's modern expressways, toll road and airports. It is the most modern and radical design change in the snow plow industry.

WAUSAU IRON WORKS WAUSAU, WISCONSIN

Pioneer Snow Plow Builders

A DEPENDABLE BUYING SOURCE

power sweeper refill fibres

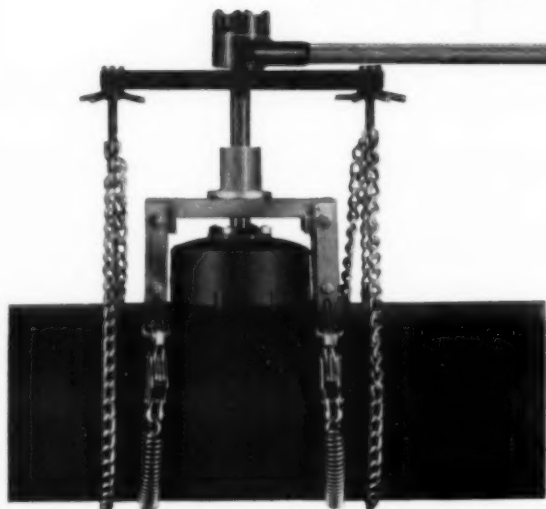
gutter wire

Wide variety of domestic and imported fibres. Large or small filled immediately from huge warehouse stock.

Tough and durable. In gauges and lengths to suit your needs. Write or call VAndyke 2-0967 for prompt Steiert service.

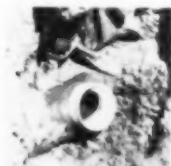
A. STEIERT & Son, Inc.
Hatfield, Penna.

NOW you can TAP CLAY SEWER PIPE! (in 4 and 6 inch sizes!)



Shower Tap Drill, hand or power operated.

Enter main at any angle. No more hunting for wye locations on maps or under streets. Affords lower construction and maintenance costs. Gives a perfect water- and root-tight connection. Allows shortest possible house service sewer every time. Wet ground no hindrance. Epoxy resin joint compound and aluminum alloy adapter equip a core drill to cut and remove perfect circle from pipe wall.



Applying Joint Material



Shower Tap Applied

Simple, swift, sure. Resulting connection stronger than original pipe. Get free literature on how to start your savings now.

SHEWER TAP INC.

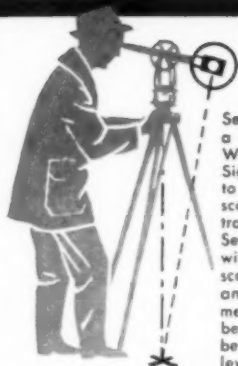
1019 Admiral Blvd.
Kansas City, Mo.

(Patents pending)

SET UP IN SECONDS!

Set up OVER or UNDER
a point with new

WARREN-KNIGHT TELE-PLUMB



Immediate, accurate set-up
over or under any point.

No more trial and error,
wasted time, building wind-
breaks for your plumb bob.

Set up fast, directly over or under
a point, with precisely accurate
WARREN-KNIGHT TELE-PLUMB.
Sight any set-up point, from nadir
to zenith, through transit tele-
scope that sights your line. Shift
transit without disturbing level.
See vertical wire cut set-up point
with full power of transit tele-
scope — far more accurate than
any other type of optical plum-
met. Nothing to attach or detach
between set-ups. TELE-PLUMB can
be used on transits or transit-
levels, fits most internal focusing
telescopes. Order direct for
Warren-Knight instrument, or
write for full details, giving make,
model and serial number.



Ask for Bulletin PW-80 that lists Full Details



Sand - Cinders - Salt for Safe Winter-time Driving



Your winter-time Ice and Snow headaches start
again in about 4 months. Are you all set to start sand-
ing? You will be if you have these tough, rugged Tarco
"Arcrite" spreaders to work with.

The Tarco "Arcrite" has everything you need.
Rugged gasoline engine. Special "No-Load" engine
starting assembly, Cog-type "B" belt and heavy roller
chain drive. Thick vertical shaft is bearing supported.
Adjusts to tail gate in any position without use of
auxiliary chute. Gate-type material controls. Safety
guard rail. Remote throttle control. Air filtered engine
compartment.

See your Tarco dealer or write us for details

TARRANT MFG. CO.

28 Jumel Place, Saratoga Springs, N.Y.

Municipal Power

variations in these voltages do not exceed a total of 5 percent for any individual consumer. It should be recognized that some of the extreme values shown are to be considered as tolerable, but not favorable for use with standard ratings of certain utilization apparatus.

As an example, a standard name-plate voltage rating for polyphase motors is 220 volts. Such a motor will operate successfully when the voltage applied to its terminals is 10 percent above or below rated voltage; that is, within the range of from 198 volts to 242 volts. Other than at rated voltage, the motor will not operate necessarily in accordance with normal rating performance standards of efficiency, etc. At subnormal voltages, the motor draws more load current, contributing to additional copper loss; while at voltages above normal, the motor is over-excited, contributing to additional core loss and a reduced power factor.

On this basis, the 220 volt motor would operate satisfactorily at the lower value of 198 volts listed for

the nominal 208 volt system group, but operation would not be satisfactory at the upper value of 252 volts shown for the 240 volt system group. Conversely, certain other equipment will operate successfully beyond the range of values listed above. As an example, a radio having a name-plate rating of 120 volts will operate within the range of 110 to 127 volts, which overlaps the maximum and minimum voltage range of 10 percent as tabulated for the 120 volt group.

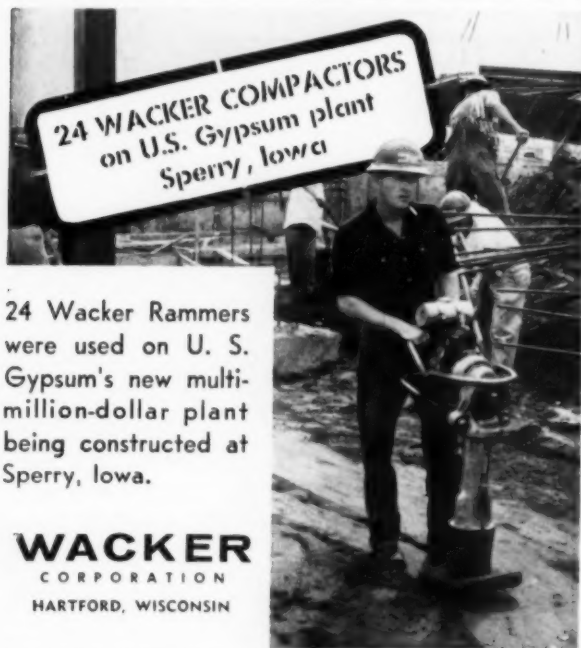
In order to provide satisfactory voltage levels at utilization points, voltage correction equipment must be employed on most systems. This is necessary to compensate for the voltage drops and fluctuations that occur throughout the system due to the magnitude and phase angle of the current that flows through the system in proportion to the varying demands of the consumers.

If consumer loads were constant, it would be possible to compensate for voltage drops in the service wires, the distribution transformers, the primary distribution feeder conductors, the substation transformers, the transmission lines, etc., by the proper setting of fixed taps in the various transformers or the system. Actually, of course, con-

sumer load demands are continually varying throughout the day, which makes it necessary to employ automatic voltage regulating equipment, such as load tap changing transformers, station type regulators of the induction or step type, and line type regulators, in addition to fixed tap settings in substation and distribution transformers. For systems which experience low power factor under peak load conditions, the use of automatically switched static capacitor banks offers an additional means for voltage drop correction.

Power plant generators may be set, manually or automatically (with line drop compensator control), to correct for voltage variations on the system by using the 5 percent plus or minus adjustments in the terminal voltages which are permissible with such equipment.

In order to determine the voltage levels in various component parts of a given distribution system, and to make suitable provision for fixed and automatic voltage regulation compensation for voltage drop due to fluctuating loads, it is often helpful to prepare a tabulation somewhat like that in Table 2, in which voltage drops through various segments of the system are based on calculated values or recording volt-



24 Wacker Rammers were used on U. S. Gypsum's new multi-million-dollar plant being constructed at Sperry, Iowa.

WACKER
CORPORATION
HARTFORD, WISCONSIN



Mark-Rite LINE MARKERS

The model shown on the left is but one of the many variations of this versatile machine—however we can build a Mark-Rite to meet your individual requirements.

Mark the line of safety with the Line Master Model 9000 self-propelled Line Marker. Can stripe 1, 2 or 3 lines in one or two colors. Ideal for municipalities, cities, airports and counties. One-man operation. Rigid steering yet can turn in 6-foot radius.

Tank capacities from 11½ to 65 gals., or can be equipped with 2 tanks. Compressor ranges from 12 to 60 CFM, with 7-25 H.P. engine. Smaller models, too.

(Immediate delivery on all standard models—nation-wide sales and service)

UNIMASCO, INC.

426 W. Redondo Beach Blvd., Gardena, California

Write for full catalog with list of satisfied users near you.

Gentlemen:
Please send me free descriptive literature and the name of your nearest dealer.

PW-8

Name

Address

City

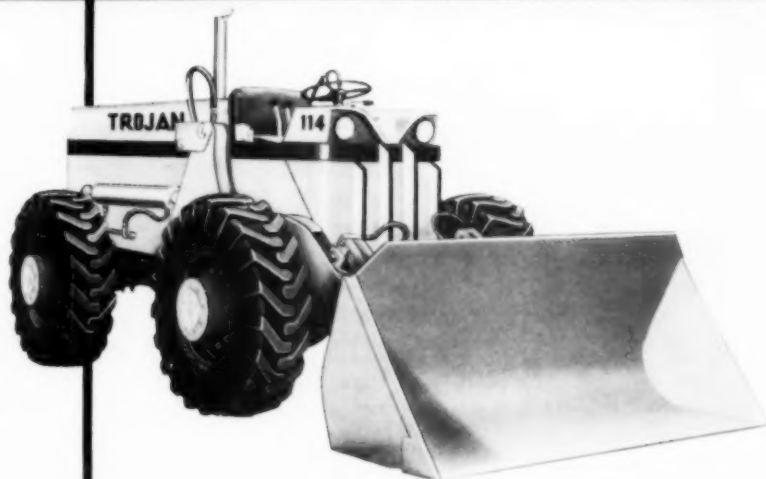
Zone

State



SAVE

WITHOUT SACRIFICE



...WITH TROJAN'S NEW 114!

TROJAN QUICK CHANGE ATTACHMENTS

LIGHT and HEAVY
MATERIAL BUCKETS

BACKHOE

BULLDOZER BLADE

CRANE HOOK

PALLET FORKS

SNOW PLOWS

HIGH-LIFT ARMS

Visit **TROJAN** at the
PUBLIC WORKS SHOW
Booths B 1, 2 and 3

'114' ECONOMY FOR YOUR TAXPAYERS...

Now—you can get the performance of a heavy-duty Trojan tractor shovel for little more than the cost of a good wheel tractor . . . There's the job flexibility offered by a complete line of attachments *plus* low operating and maintenance costs . . . all at a budget price that will satisfy critical taxpayers. *Saves taxpayers' money without sacrificing work production!*

'114' PERFORMANCE FOR YOUR ROAD CREWS...

The safe and easy operation with finger-tip controls, full power shift transmission and planetary axles will help your operators to handle far more work per day—make swift moves at 25 m.p.h. speeds . . . Quick-change attachments give them a 'one machine fleet' for maximum daily operating efficiency. *Saves operator's time without sacrificing work production!*

TROJAN TRACTOR SHOVELS ARE
AVAILABLE IN 7 MODELS—LIFTING
CAPACITIES FROM 6,500 to 24,000 LBS.

TROJAN®
TRACTOR SHOVELS
YALE & TOWNE

THE YALE & TOWNE MFG. CO.
TROJAN DIVISION
BATAVIA, NEW YORK

NY 44-72

Table 2—Basic System Voltage Drop and Regulation

Section of Generation, Transmission, and Distribution System	Percent Voltage Drops		Bus Voltages in Percent		Bus Voltages in Volts On 120 Volt Base	
	Minimum Load Condition	Maximum Load Condition	Minimum Load Condition	Maximum Load Condition	Maximum Load Condition	Minimum Load Condition
Power Plant Generator Bus			95.0	105.0	114.0	126.0
Step-Up Transformers	1.5	4.0				
Power Plant Transmission Bus			93.5	101.0	112.2	121.2
Transmission Lines	(-)10.0	9.5				
Substation Transmission Bus			103.5	91.5	124.2	109.8
Substation Trans. Drop	1.5	4.0				
Subs. Trans. Fixed Tap	(-)10.0	(-)10.0				
Substation Un-Regulated Distribution Bus			112.0	97.5	134.4	117.0
Subs. Auto. Voltage Reg.	10.0	(-)10.0				
Substation Regulated Distribution Bus			102.0	107.5	122.4	129.0
Primary Distr. Lines	1.5	9.5				
Primary Side of Dist. Trans.			100.5	98.0	120.6	117.6
Distr. Trans. Secondary & Service Drop	1.0	6.0				
Distr. Trans. Fixed Tap	(-) 2.5	(-) 2.5				
Ultimate Consumers' Meter			102.0	94.5	122.4	113.4

NOTE: "(-)" Indicates Voltage Rise

meter surveys, and possible voltage boosts or bucks are determined from known characteristics of voltage corrective equipment.

In the theoretical example of Table 2, the net voltage regulation at the ultimate consumer's meter would be 7.5 percent between full

load and minimum load, representing a voltage fluctuation between 113.4 volts and 122.4 volts on a 120 volt basis. To provide this level of service, the fixed taps on the substation transformer and distribution transformer were assumed to be set at 10 percent boost and at 2.5

percent boost respectively, and it has been assumed that the full range of automatic voltage regulation would be in operation, amounting to 10 percent for the power plant generators and to 20 percent for the substation voltage regulators.

Obviously, there are other meth-

"Jet" Spreaders



A SIZE AND STYLE FOR EVERY NEED! Ideal for salt, cinders, sand or gravel, cab operated "Jet" Spreaders provide the speed and capacity essential for fast efficient ice control on streets and highways.

Available in engine-driven, hydraulic and direct power take-off models. Width and depth of spread, and spread pattern are easily varied to meet any requirement. Standard models feature 5½ and 6 cubic yard hopper capacities... larger sizes are also available.

For complete information, see your Good Roads distributor or write:

 **GOOD ROADS MACHINERY Corp.**
MINERVA, OHIO

"Snow removal jobs go three times faster with MONARCH POWER HYDRAULIC CONTROLS"



DYNA-MIGHT
Battery-Operated

HY-LO-JACK

HY-LO FOR JEEP
Fan-Belt Driven

says
E. H. UECKER

Madison Square Garage,
Grand Rapids, Mich.

Mr. Uecker has found what everyone finds — that Monarch Power Hydraulic Controls make snow removal jobs easier, faster, and more economical! One man controls the plow from the cab... instant up-and-down action with the flick of a wrist. Battery-operated or fan-belt driven units. See your dealer. Free folder upon request.

MONARCH ROAD MACHINERY COMPANY
1331 Michigan St., N.E. Grand Rapids 3, Michigan

ads by which suitable voltage levels could be maintained. For example, primary circuit feeder voltage regulators could be used in place of, or in addition to the automatic voltage regulators in the substation. Also, by setting the distribution transformer on a fixed tap of 5 percent boost (instead of 2.5 percent boost) the theoretical voltage spread at the consumer meter load point illustrated could be raised for a range between 116.4 volts and 125.4 volts.

In another distribution system, designed for a lower range of voltage drop fluctuation on the primary feeder circuits than that shown in this illustrative example, it would be entirely feasible to use distribution transformers without any fixed taps, at a considerable saving in the purchase price of such equipment.

The determination of the proper design of a given system, and the selection of the type and range of fixed and automatic voltage control equipment necessary to provide a high degree of service, is a matter of economics as well as of technical requirements for the individual system.

• • •

Training Program for Construction Engineering Aide

A course of study to provide sub-professionally trained personnel has been developed by the Vocational Technical High School of Opelousas, La. This course, which requires 2,640 hours of study over 88 weeks, includes basic mechanical drawing; blue-print reading; some trigonometry; calculating machines; mechanics and strength of materials; plane surveying; mapping and drafting; estimating; methods of construction; concrete; soils; paving materials; and typing and business communications. Instructional material on these subjects will be appreciated by the director of the course, Glenn Madere.

• • •

Management Organization for Public Works Utilities

An organization, Foresite Management Associates, has been formed to specialize in the management and operation of water, sewage and industrial waste facilities, both community and private, with special reference to smaller installations. Composed of a former village manager-attorney, a professional engineer and a chemist, the organization has offices at 53 West Jackson Blvd. (Room 1104), Chicago 4, Ill.

PUBLIC WORKS for August, 1960

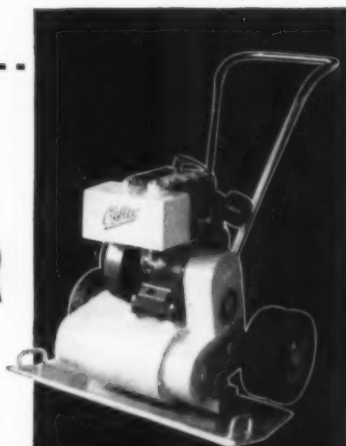
PACK, PACK, PACK . . .

with the

Kelley

POWER TAMPER

Twenty-four hundred times a minute the Kelley 36KT Power Tamper hits with a force of tons, with the compacting force of a massive power roller. But Kelley Power Tamperers are handier than rollers. They can pack earth backfill to maximum density next to foundations, piers, in pipeline trenches, on road jobs, etc. Also for finishing blacktop, with heater shoe attachment available.



Two models to choose from: Model 36KT (above) with 30" or 36" wide shoe, and Model 18KT with 18" or 24" wide shoe.

Below, Model 18KT packing down sub-base materials on a road-widening job.



Kelley

MACHINE DIVISION

The Wiesner-Rapp Co., Inc.
285 Chicago St.
Buffalo 4, N. Y.

Please send us information on Kelley Tamperers.

NAME _____

STREET _____

CITY _____

ZONE _____ STATE _____



TWO PIECE

sliding or screw type cast iron valve boxes for covering 4" thru 10" valves for water or gas. Rugged construction for lifetime service. 5 1/4" shaft. Extensions as required.

Adjustable VALVE BOXES THREE PIECE

valve boxes supplied with separate bases are available in sliding or screw type. Made with 5 1/4" and 7" shafts with extensions as required. Complete line of service and road-way boxes.

ALABAMA PIPE CO.

General Sales Offices ANNISTON, ALABAMA

We invite inquiries to Our Nearest Sales Office

122 South Michigan Ave., Chicago 3, Illinois.
350 Fifth Ave., New York 1, N.Y.
950 Dirks Building, Kansas City, Missouri
18505 W. Eight Mile Rd., Detroit 41, Mich.
5335 Southern Ave., South Gate, Calif.

APCO

EITHER BY THE GLASSFUL, OR THE BILLIONS OF GALLONS . . .

. . . pure water is the lifeline of Municipalities and Industry.

For over 60 years, Roberts Filter Manufacturing Company has been complementing the engineering profession in supplying water purification equipment throughout the Western Hemisphere.

ROBERTS FILTER

Manufacturing Company
Darby, Pa.

COMMUNITY CENTER

OFFERS MANY ACTIVITIES—

OKA T. HESTER

Director, Park and Recreation
Department
Greensboro, N. C.

A VERY functional and attractive building, known as Warnersville Community Center, has just been completed in Greensboro, bringing the total number of recreation centers to three. The completion of this modern facility was brought about by the efforts and cooperation of the City Council, Mayor, City Manager and the Greensboro Park and Recreation Commission.

The building, oriented north/south, is situated in the center of a park area in which are located tennis courts, ball diamond, playground equipment, and other facilities which make this an ideal neighborhood community center.

A community center is for all the people all the time and a good community center program is good community business. Since a recreation building should provide facilities and activities for all age groups, especial care was taken to see that this building adequately took care of these needs. Space is afforded for combination gymnasium-auditorium-social hall, game room for ping pong and similar games, clubroom or meeting room, office, lobby-lounge, kitchen, adequate storage

space, restrooms, janitor's closet, area for food and drink dispensing machines, furnace rooms, and a large entrance porch.

Activities will include scheduled programs as well as unorganized activities, such as an occasional ping pong game, dancing to an automatic record player, or just sitting and relaxing. A typical list of activities operated in the gymnasium-auditorium-social hall would be basketball, archery, badminton, golf lessons, handball, dances, banquets and parties. In the clubroom or meeting room, smaller banquets and parties could be held along with club and youth program meetings. The lobby-lounge is of sufficient size to accommodate tables and chairs for table games, while the game room would be used for ping pong and many different types of table games.

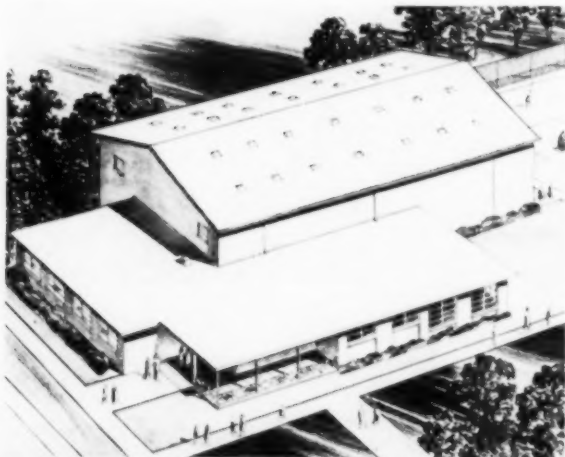
A spacious 21 x 31 foot patio porch at the main entrance of the building is an attractive feature, and will add to the comfort and convenience of those entering or leaving the building during inclement weather. Entrance to the building is through a large lobby-lounge area, complete with bulletin board, electric water cooler and lounge furniture.

The principal feature of the building is the 52 x 86 foot multi-purpose room which will be used as gymnasium-auditorium-social hall. A unique feature of this room is that

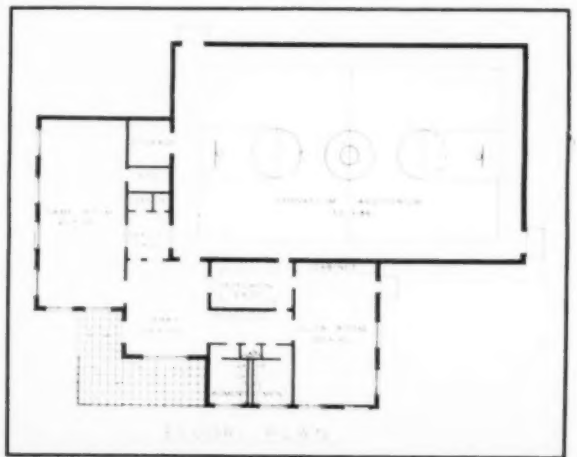
no outside windows are incorporated. This is considered desirable, particularly for daytime basketball play since the players will not be blinded by light streaming through windows. Skydomes in the roof provide adequate light during the day. The lighting arrangements of the room are such that the fixtures are placed close to the ceiling so as not to interfere with the playing of basketball and other games. Proper ventilation for this large room is provided by two 48-in. low-speed exhaust fans capable of changing the entire volume of air every sixty seconds. Fresh air intake louvers have been installed at the end of the gymnasium opposite the fans. The fans will also pull fresh air through the other rooms of the building when the door connecting the gymnasium and lobby is left open.

Particular attention is called to the large game room, 21 ft. by 46 ft. in size, where organized games for large groups can be operated. Six large 7-ft. windows provide ventilation and light and an 8-ft. entrance into the lobby assures quick access and exit. Shelves are provided, as well as a storage room equipped with adjustable shelving for game equipment.

The 10-ft. by 11-ft. 6-in. office is strategically placed near the center of the building and adjacent to gymnasium, lobby and game room.



● ARCHITECT'S sketch of the spacious Warnersville Community Center. Building has 8,330 square feet of floor space.



● FLOOR PLAN shows convenient arrangement of the various rooms. Building is situated near outdoor sports facilities.

Books and Reprints For Your Engineering Library



Water Supply and Purification

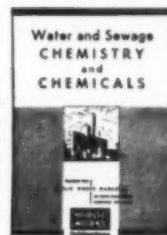
By W. A. Hardenbergh

Among the major changes introduced in this latest edition are the following: The chapters on ground water, on filtration, and on laying pipe and maintaining lines have been almost completely rewritten; the chapters on pipe conduits and on disinfection have been revised to bring the material in them up-to-date; and a new chapter has been added on fluoridation. Design examples of all kinds are worked out in detail to illustrate practical, up-to-date methods. To order your copy circle C-1 on the coupon.

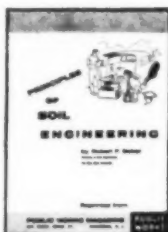
\$7.25 C-1

Water and Sewage Chemistry and Chemicals

If you are not an expert chemist but want a dependable text on chemistry as applied to sewerage and water works—send for this valuable reprint today. Written in plain language so anyone can understand it. Four color illustrations are used to show the exact nature of colorimetric reaction in some specific laboratory tests—something that is possible only with this type of work. Of special interest to water or sewerage plant operators. To order your copy just circle number C-2 on the handy coupon.



\$1.00 C-2



Principles of Soil Engineering

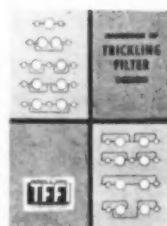
By Robert F. Baker

A knowledge of soils and soil engineering is important for all who deal with earth for engineering problems. Rarely is a structural design evaluated without recognition of the soil characteristics affecting foundation requirements. Without attempting to develop detailed concepts and procedures, Professor Baker has presented a comprehensive discussion of the subject of soil behavior in terms of basic principles. To order your copy of this informative 40 page booklet circle number C-3 on the coupon.

\$1.00 C-3

Handbook of Trickling Filter Design

This is the fourth edition of this informative and valuable 38 page Handbook. It has been completely revised, rewritten and brought up to date. Among the many subjects included are General Design, Media, Drainage and Ventilation, The Aerofilter: Description and Design Data, Standard Rate Filters, General Design for High Rate Filters, The Biofiltration System, The Accelo-Filter System of Wastes Treatment Trickling Filters for Industrial Wastes Treatment. A Nomographic Solution for Trickling Filter Design. Circle number C-4 on the coupon.



\$1.00 C-4



The Design of Small Water Systems

By Joseph A. Salvato, Jr., P.E.

Water systems to serve small communities, institutions, camps, turnpike service areas and isolated commercial establishments present special problems for the designer. In this excellent 28 page reprint the author considers design standards, equipment, filtration, sources and treatment, quality problems, pumping distribution, coagulation and settling, operation control, storage and related factors for systems capable of supplying 15,000 to 200,000 gallons per day. Just circle C-5 on the coupon for your copy.

\$1.00 C-5

Sewerage and Sewage Treatment

By W. A. Hardenbergh

An authoritative yet simple treatment of the subject by one of the nation's foremost authorities, Mr. Hardenbergh's editorial and field work has brought him in close contact with the problems that trouble the average engineer and in this book he explains those methods most suitable for general use. Special attention is paid to sewerage systems, both storm and sanitary. Design examples of all kinds are worked out in detail to illustrate practical, up-to-date methods. To order your copy circle C-6 on the coupon.



\$7.25 C-6



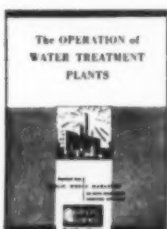
The Operation of Sewage Treatment Plants

This valuable text has been completely revised, expanded and brought up to date. In it all phases of Sewage Treatment Plant operation are treated in simple, easily understandable language. Among the many subjects covered are: measurement flow; concentration and temperature; sampling sewage for analysis; laboratory determinations; purposes of treatment; operation of grit chambers; operation of screens; trickling filter operation; filter fly control; disposal of sludge; etc. Circle C-7 for your copy.

\$1.00 C-7

The Operation of Water Treatment Plants

Here in one place you have the basic information concerning all phases of plant operation. Even those without previous technical school education will find it easy to learn from this valuable text. Completely revised, expanded and brought up to date by Clayton H. Billings, Associate Editor of Public Works. This reprint is of special interest to Water Works Superintendents, Water Treatment Plant Operators and everyone connected with the Water Works field. To order your copy circle C-8 on the coupon.



\$1.00 C-8

PUBLIC WORKS Magazine
200 So. Broad St., Ridgewood, N. J.

C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8
(\$7.25)	(\$1.00)	(\$1.00)	(\$1.00)	(\$1.00)	(\$7.25)	(\$1.00)	(\$1.00)

I enclose \$..... for which please send me postpaid the books I have circled above.
I understand I may return any of them within ten days for full refund if not satisfied.

Name
Title
Address
City Zone State

**PUBLIC
WORKS**
Publications

Windows six feet wide give good range of view into these rooms, thus making for easy supervision by the director of the center. A storage room is provided for the equipment used in the game room, and a separate storage room is used for storing office supplies and items of a general nature.

The 20-ft. by 35-ft. clubroom or meeting room is located in the northwest corner of the building, away from the noise of the lobby and game room. Storage cabinets will serve the various organizations using the room. A built-in sink is

provided, and also an area for the installation of a kiln. The clubroom or meeting room has an outside doorway for emergency exit, and for future expansion.

Connecting the lobby and the clubroom is a corridor, in which are located automatic dispensing machines. These food and drink machines eliminate the need for a snack bar with the necessary operating personnel. Opening from this corridor on one side are the restrooms for men and women and janitor's closet, and opposite is the entrance to the kitchen. The 11-ft. by

20-ft. kitchen is so located that food can be easily served into the gymnasium on one side, the clubroom on the other, or across a counter into the lobby. The kitchen has built-in cabinets with formica tops and is equipped with electric range and refrigerator. The kitchen also contains a three-compartment sink meeting the state health regulations regarding food preparation areas.

The complete heating system of the building consists of two furnaces and three overhead unit heaters, all of which are automatic, gas-fired. One furnace heats the game room and office-lobby area, and the other furnace heats the clubroom, kitchen and restrooms. The three overhead unit heaters are located in the gymnasium. The arrangement of this heating system makes it possible to heat one part of the building without heating the other, thus effecting considerable saving in labor and fuel consumption.

The exterior walls of the building are brick and the interior walls are concrete block painted. The roof framing consists of laminated wood trusses and beams, which give a very pleasing appearance. The ceiling is a fire resistant, acoustical fibrous material, painted white for light reflection. Steel windows and steel door frames make for low maintenance cost, as do the concrete floors finished with vinyl asbestos tile.

The City Council budgeted \$65,000 for this Center, and it is interesting to note that the contract price was \$65,246,000. The cost per square foot for the general contract was \$6.35, and for the electrical, plumbing and heating \$1.49, making the total cost of construction \$7.84 per square foot, which is exceedingly low. The building was planned by the Charles M. Graves Organization, Atlanta, Georgia.

• • •

A Road Heating Installation

A road with a heated area of approximately 54,000 sq. ft. has been opened to traffic in Edinburgh, Scotland. The heating cables were covered with a half inch sand-asphalt fill before a sand asphalt wearing course 1½ ins. thick was laid. The installation is operated automatically by prevailing weather conditions. Moisture detectors, frost penetration indicators and temperature sensing units are installed in the road surface. There are also air thermostats, snow detectors and an emergency cut-off unit.

WHEELER PIPE CUTTER Caught in the act!



High speed photography catches this Wheeler Heavy Duty Hydraulic Model Pipe Cutter as it "Squeezes and Pops" a length of Class 150 AWWA Cast Iron Water Main 16" in diameter.

The Heavy Duty Hydraulic Cutter and the new Wheeler Jr. Hydraulic Pipe Cutter can handle a wide range of Cast Iron Water Main plus a great variety of other materials. Both cutters are simple to operate. They make fast, clean cuts. The Wheeler hydraulic cutters are equipped with convenient separate hydraulic pumps.



The New Wheeler Jr. Hydraulic Pipe Cutter

The Jr. Hydraulic cuts

2" thru 8" Std. or XH Soil Pipe
4" thru 15" Tile
2" thru 8" Corrosion Resistant Pipe
4" thru 8" Asbestos Cement Pipe
2" thru 3" C.I. Water Main

The Heavy Duty Hydraulic cuts

CLASS 150 AWWA WATER MAIN 4" thru 18"
CLASS 250 AWWA WATER MAIN 4" thru 12"
CEMENT LINED CAST IRON WATER MAIN 4" thru 12"
STD. OR XH SOIL PIPE 6" thru 15"
ASBESTOS CEMENT PRESSURE PIPE 6" thru 12"
TERRA COTTA OR TILE PIPE 6" thru 36"

See you at Booth B-65 at the A.P.W.A. in New York

The Wheeler Manufacturing Corp.

P. O. Box 688

Ashtabula, Ohio

Increased Use of Road Edge Striping

A large increase in use of reflective safety edge striping of highways is reported in a survey of state highway departments. Mileage of edge markings passed 55,000 last year and it is indicated will probably reach 70,000 this year.

A record number of highway departments reported that edge striping has brought reductions in accidents, particularly during night and low visibility hours, and savings in shoulder maintenance by keeping vehicles off shoulders. Public reaction was reported generally favorable, running from "good" to "enthusiastic."

Edge marking, according to 15 states, notably reduced accidents; seven so reported last year; and ten states indicated reduction in shoulder maintenance against two last year. Only seven states report not using the edge lines.

In all, 26 states and Puerto Rico reported mileage increases for 1960, with Pennsylvania planning 10,000 miles compared to 300 last year. Other states reporting large increases were Florida from 2,100 to 2,880 miles; Georgia 1,067 to 2,000

miles; Illinois from 3,300 to 5,000 miles; Indiana 1,000 to 1,500 miles; Iowa none to 790 miles; Michigan 1,100 to 1,400 miles; Tennessee none to 500 miles. Ohio continues to lead with 15,303 miles, up from 14,493. Other large mileage states were Alabama 1,200; Connecticut 1,550; Kansas 1,384; Maryland 1,808; Minnesota 900; Mississippi 1,030; New Jersey 1,850; North Carolina 8,234; Utah 2,000.

Connecticut, Ohio and Illinois reported studies on the effectiveness of edge markings, each with conclusions that improvement in safety and motorist convenience and assurance is noted. Studies indicated that better placement of vehicles occurred both day and night after edge striping, with chief benefit an increase of center-clearance at night.

Conclusions of the study in Connecticut, which in 1940 was the first state to initiate edge markings, are: 1) a painted reflective edge line affects lateral position of vehicles with most significant change during darkness; 2) some reduction of leaving-roadway-on-right accidents is apparent on 4-lane divided highway

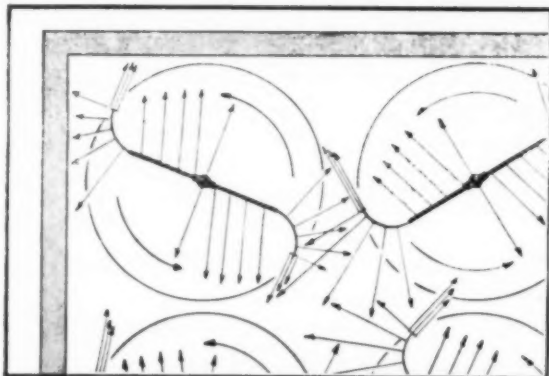
after edge-marking; 3) edge lines along roadways where pedestrians must use shoulders offer additional security to both pedestrians and drivers; 4) it appears an outer edge line provides pavement delineation and a point for drivers to focus eyes when faced with oncoming traffic; 5) edge markings appear to have some influence on operating speeds, which might permit a deduction that delineation increases driver confidence with resulting safer operation.

Cataphote Corporation made the survey and has tabulated the results by states. These data are available from the Corporation which has offices in Jackson, Miss., and Toledo, Ohio.

Days Without Rainfall in Alabama

A report on low-flow and flow-duration data for Alabama streams prepared by the USGS and the Alabama Water Improvement Commission, reports on long dry periods. Data for eight selected stations give the greatest number of consecutive days without measurable rainfall. The stations; the period of record; the year of minimum rainfall and its amount; and the days without rain-

NOW! A 25% to 30% further increase in filter cleaning efficiency



New S-Type Filter Arms double the cleaning action

With new S-Type arm of Agitator shown above each corner and void area receives four (4) agitating impulses per revolution instead of two . . . doubling the cleaning action in those areas. S-Type Arms can also be adapted to older units in service. Ask us for full particulars.

(Patent Pending)

Palmer Filter Equipment Co.

822 E. 8th St.
Erie, Penn.

Fast, Low-Cost Ice Control



You control ice and snow **Faster** and **Cheaper** with straight de-icing salts. The TARCO "Scotchman" is the **only** spreader **especially** designed for the correct application of these materials.

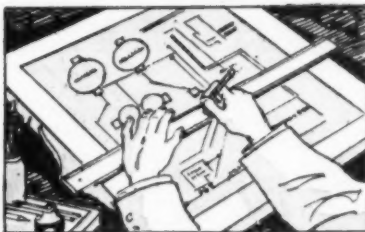
This "Jeep" mounted "Scotchman" uses the 1 cu. yd. **Watchman Hopper**. Here's enough materials to cover more than 5 miles of pavement, 30 feet wide. One man operation. Use the **job-proven** "Scotchman" on any of your trucks: dump body, pick up, stake body or "Jeep".

Watchman Hopper, all gravity feed, is available in 3 cu. yd. capacity for dump body use. Remember: when it comes to snow and ice control, **Nothing Saves Like a "Scotchman"**.

TARRANT MFG. CO.

28 Jumel Pl., Saratoga Springs, N. Y.

CONSULTING ENGINEERS



CITY, COUNTY

AND STATE

ALSTER & ASSOCIATES, INC. ENGINEERS ***cuts your mapping costs***

Write for free brochure on mapping and aerial photography.

6135 Kansas Ave., N.E., Washington 11, D.C. TA 9-1167

Brockway, Weber & Brockway

Engineers, Incorporated
Roy E. Weber
Staff

George S. Brockway

George R. Brockway

H. L. Fitzgerald

Ben E. Whittington

Robert E. Owen

Ernest L. Greene

Thomas A. Clark

Thomas R. Demery

Charles A. Anderson

Civil, Structural, Sanitary, Municipal, Electrical, Land Planning

West Palm Beach, Florida

Fort Pierce, Florida

GIBBS & HILL, Inc.

Consulting Engineers

Industrial Wastes
Water & Sewage Works
Hydraulic Developments

Electric Transmission & Distribution Systems
Convention & Nuclear Power Generation
Power Surveys & Contracts

Airports
Rapid Transit
Highways & Bridges

PENNSYLVANIA STATION NEW YORK 1, N.Y.

JOHN McNAIR
WAYNESBORO, VA.

M. T. DECKER
CHARLOTTESVILLE, VA.

AND ASSOCIATES

CONSULTING CIVIL ENGINEERS
STUDIES, REPORTS, DESIGN, CONSTRUCTION SUPERVISION,
HIGHWAYS, AIRPORTS, UTILITIES
COMMUNITY FACILITIES

ROBERT AND COMPANY ASSOCIATES

Municipal Engineering Division

ATLANTA

WATER SUPPLY, SEWAGE DISPOSAL, INCINERATORS, POWER PLANTS



Abrams Aerial Survey Corporation
Photogrammetric Services

**AERIAL PHOTOGRAPHY,
TOPOGRAPHIC MAPS,
ATLAS SHEETS AND MOSAICS**

(Vanhee 4-9441)

Lansing, Michigan

ALBRIGHT & FRIEL INC.

Consulting Engineers

Water, Sewage, Industrial Wastes and Incineration Problems
City Planning Highways, Bridges and Airports
Dams, Flood Control, Industrial Buildings
Investigations, Reports, Appraisals and Rates

**THREE PENN CENTER PLAZA
PHILADELPHIA 2, PENNSYLVANIA**

AERO SERVICE CORPORATION

Aerial topographic maps — photo-maps or engineering projects anywhere in the world — highways, railroads, cities, power and pipe lines, mining development. Soil studies and electronic surveys of large areas; resources inventories.

210 E. Courtland

Philadelphia 20

ALVORD, BURDICK & HOWSON

Engineers

Water Works, Water Purification,
Flood Relief, Sewage, Sewage Disposal, Drainage, Appraisals, Power Generation

20 No. Wacker Dr.

Chicago 6, Ill.

AMERICAN AIR SURVEYS INC.



*Aerial Topographic Maps
Aerial Photos & Mosaics
for*

municipal planning & engineering

• pipe lines • roads, airports • tax maps
907 Penn Ave., Pittsburgh 22, Pa.
A Nationwide Service

FOR RATES FOR THIS SPACE

Write

PUBLIC WORKS MAGAZINE

200 So. Broad St., Ridgewood, N.J.

MICHAEL BAKER, JR., INC.

THE Baker Engineers

Civil Engineers, Planners, and Surveyors
Airports, Highways, Sewage Disposal Systems,
Water Works Design and Construction—
City Planning—Municipal Engineering—
All types of Surveys

Home Office: Rochester, Pa.
Branch Offices:

Jackson, Miss.

Harrisburg, Pa.

BANISTER ENGINEERING CO.

Consulting Engineers

"Staffed to completely fill municipal requirements for professional service"

310 No. Snelling Ave. Tel. Midway 6-2612
St. Paul 4, Minnesota

BARNARD AND BURK

Consulting Engineers

Municipal and Industrial Engineering Surveys,
Reports, Waterworks, Sewerage and Sewage Disposal,
Revenue Projects, Natural Gas, Light and Power,
Streets and Highways, Harbor and Port Developments

1023 Nicholson Drive
Baton Rouge, Louisiana

E. D. BARSTOW & ASSOCIATES

Engineers

Water Supply, Treatment, Distribution
Sewage Collection, Treatment, Disposal
Trade Waste Treatment

163 N. Union St.

Akron 4, Ohio

FOR RATES FOR THIS SPACE

write

PUBLIC WORKS MAGAZINE

200 So. Broad St.

Ridgewood, N.J.

HOWELL K. BELL

Consulting Engineers

G. S. Bell C. G. Gaither J. K. Luthom
J. W. Finney, Jr.
Water Works Sewage Disposal
Water Purification Sewerage
Swimming Pools Refuse Disposal
Industrial Wastes
553 S. Limestone St. Lexington, Ky.



BENHAM ENGINEERING COMPANY

Consulting Engineers

215 NE 23rd Oklahoma City
Established 1909

Bonham, Kuck, Grant and Brundage

H. E. BONHAM N.YE GRANT
CARL E. KUCK J. M. BRUNDAGE
Consulting Engineers
Sewage and Industrial Waste Treatment
Water Supply and Purification
4954-58 N. High St. Columbus 14, Mo.

BLACK & VEATCH

Consulting Engineers

Water-Sewage-Gas-Electricity-Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Pkwy., Kansas City 14, Mo.

CLINTON BOGERT ENGINEERS

Consultants

Clinton L. Bogert (van L. Bogert)
Donald M. Dismers Robert A. Lincoln
Charles A. Mangano William Martin
Water & Sewage Works Incinerators
Drainage Flood Control
Highways and Bridges Airfields
145 East 32nd Street, New York 16, N.Y.

J. W. ARCH BOLLONG AND ASSOCIATES

Consulting Engineers

Traffic and Transport Consultant
Street Lighting Engineer
Traffic Engineer Urban Renewal
Marine Design Building Design
Municipal Engineer
5240 Leary Avenue Seattle 7, Wash.
Sunset 4-9060 Res. SU. 4-2083

BOWE, ALBERTSON & ASSOCIATES

Engineers

Water and Sewage Works
Industrial Wastes
Refuse Disposal
Valuations
Laboratory Service
75 West St. 1000 Farmington Ave.
New York 6, N.Y. West Hartford 7, Conn.

FOR RATES FOR THIS SPACE

write

PUBLIC WORKS MAGAZINE

200 So. Broad St. Ridgewood, N.J.

BOYLE ENGINEERING

Architectural & Engineering Consultants

Water-Development, Treatment, Storage, Dis-
tribution, Sewage Collection, Sewage Treat-
ment, Refuse.
Waste Disposal-Industrial, Commercial, Residen-
tial, Municipal, Highways, Streets, Bridges,
Parks, Harbors, Flood Control, Special Dis-
tricts, Civic, Industrial, Commercial Buildings,
Structures, Site Planning
Bakersfield Santa Ana San Diego
California California

Floyd G. Brown and Associates

Consulting Engineers

F. G. Browne S. W. Kuhner
W. G. Smiley G. M. Hinkamp
C. R. Martin W. H. Kuhn
Water Supply and Purification - Sewage and
Industrial Waste Treatment - Refuse Dis-
posal - Electric Systems - Surveys - Reports
Valuation and Rates
Marion, Ohio

FOR RATES FOR THIS SPACE

write

PUBLIC WORKS MAGAZINE

200 So. Broad St. Ridgewood, N.J.

BROWN ENGINEERING CO.

Consulting Engineers

Waterworks, Sewage Disposal, Airports
Street Improvements, Power Plants
Electric Distribution, Rains
508 TENTH STREET DES MOINES 9, IOWA

BUCK, SEIFERT AND JOST

Consulting Engineers

Water Supply Sewage Disposal
Hydraulic Developments
Reports, Investigations, Valuations
Rates, Design, Consultation, Operation
Management, Chemical and
Biological Laboratories
112 East 19th St. New York City

BURGESS & NIPLÉ

Consulting Engineers

Established 1908
Water supply, treatment and distribution
Sewage and Industrial wastes disposal
Investigations, reports, appraisals, rates
Airport, Municipal Engineering, Supervision
2015 West Fifth Ave. Columbus 12, Ohio

RALPH H. BURKE, INC.

Consulting Engineers

Traffic Studies Underground Garages
Parking Structures Grade Separations
Expressways, Airports and Terminal Buildings
Shore Protection Municipal Engineering
Parks Field Houses Swimming Pools
26 North Wacker Drive, Chicago 6, Ill.

BURNS & McDONNELL

Engineers - Architects - Consultants

4400 E. 63rd St., TRAFFICWAY
KANSAS CITY 41, MISSOURI

J. W. BURT

Civil Engineer and Designer

Specializing in
ROADS AND BRIDGES
PHONE 1701 P.O. BOX 381
McCOMB, MISSISSIPPI

CARL BUSSOW

Consulting Chemist and Paving Engineer

Specialist on
Asphalt Petroleum and
Tar Products
801 Second Ave. New York 17, N.Y.

CAMP, DRESSER & McKEE

Consulting Engineers

Water Works and Water Treatment
Sewerage and Sewage Treatment
Municipal and Industrial Wastes
Investigations and Reports
Design and Supervision
Research and Development
Flood Control
18 Tremont Street Boston 8, Mass.

Capitol Engineering Corporation

Consulting Engineers

Water Works Sewage Systems
Design and Surveys Roads and Streets
Planning Airports
Bridges Dams
Executive Offices: Dillsburg, Pa.
Dallas, Texas Rochester, N.Y.
Pittsburgh Washington
Saigon, Vietnam

JOHN A. CAROLLO

Consulting Engineers

Water Supply and Purification, Sewerage
Sewage Treatment, Power Generation and
Distribution Gas Systems, Valuations
3308 N. Third St., Phoenix, Arizona
2168 Shattuck Ave., Berkeley 4, Calif.

HOMER L. CHASTAIN & ASSOCIATES

Consulting Engineers

Civil, Structural, Mechanical, Industrial Design
& Supervision, Construction, Engineering, Turn-
pikes, Bridges, Water Supply, Sewerage, Flood
Control & Drainage, Material Controls, Municipal
Engineering, Topographic Surveys.

155½ West Main Street Decatur, Illinois

THE CHESTER ENGINEERS

Water Supply and Purification
Sewage and Industrial Waste Treatment
Power Plants-Incineration-Gas Systems
Valuations-Rates-Management
Laboratory-City Planning

601 Suisman Street, Pittsburgh 12, Penna.

CHICAGO AERIAL SURVEY

PHOTOGRAMMETRIC ENGINEERS

Aerial photography since 1923. Complete
photogrammetric services for city, county,
highway and consulting engineers.
Developers of Sonnet Strip Photography
• Base maps and atlas sheets • Precise topo-
graphic maps for sewerage studies, construction
planning and site location • Scaled mosaics and
pictorial presentations • Highway studies, Street
and road maps, Sonne photography.
10265 FRANKLIN AVE., FRANKLIN PARK, ILL.
A Division of Chicago Aerial Industries, Inc.

FOR RATES FOR THIS SPACE

WRITE

PUBLIC WORKS MAGAZINE

200 So. Broad St., Ridgewood, N.J.

CLARK, DAILY AND DIETZ

Consulting Engineers

Sewerage, Waterworks, Street Lighting, High-
ways, Swimming Pools Surveying and Mapping,
Land Development Studies, Bridges, Buildings,
Foundations.
211 North Race St. 188 Jefferson St.
Urbana, Illinois Memphis, Tennessee

CLARK & GROFF ENGINEERS

Consulting Engineers

Civil, Sanitary & Municipal Engineering
Investigations, Reports, Plans
Supervision of Construction
Laboratory

3240 Triangle Dr. Salem, Oregon

CHAS. W. COLE & SON*Engineers—Architects*3600 E. Jefferson Blvd. 2112 W. Jefferson St.
South Bend, Indiana Joliet, Illinois**CONSOER, TOWNSEND & ASSOC.
—CONSULTING ENGINEERS—**

Sewage treatment, sewers, storm drainage, flood control—water supply and treatment—Highway and bridges—Airports—Urban renewal—Electric and gas transmission lines—Rates studies, surveys and valuations—Industrial and institutional buildings.

360 EAST GRAND AVENUE
CHICAGO 11, ILLINOIS**CRAWFORD, MURPHY & TILLY**
*Consulting Engineers*Water Works—Impounding Reservoirs
Highways—Municipal Streets—Expressways
Traffic Problems—Airports—Swimming Pools
Sewers—Sewage Treatment—Wastes Treatment
Storm Drainage—Flood Control—Surveys and Reports755 So. Grand Ave., W. Lakeside 8-5619
Springfield, Ill.**ALFRED CREW***Consulting Engineers*Water Supply, Treatment and Distribution
Sewerage and Sewage Disposal
Drainage and Industrial Wastes

45 N. Broad St. Ridgewood, N.J.

DANIEL, MANN, JOHNSON & MENDENHALL*Planning — Architecture — Engineering*Airports Water Supply & Purification
Harbors Sewage Treatment Plants
Rapid Transit Storms Drains
Urban Renewal Municipal Buildings
Traffic & Parking Industrial & Commercial
Reports & Consultations Buildings
3325 Wilshire Boulevard Los Angeles, Calif.
Honolulu, Hawaii Washington, D.C.**DE LEUW, CATHER & COMPANY***Consulting Engineers*Public Transit subways
Traffic & Parking Railroad Facilities
Expressways Industrial Plants
Grade Separations Municipal Works
Urban Renewal Port Development
150 North Wacker Drive, Chicago 6
San Francisco Toronto Boston**H. G. DILL COMPANY***Consulting Engineers*H. G. Dill J. A. Rousculp
G. W. Hockaden B. W. Lipas
Civil, Sanitary, Structural, Municipal, Highway,
Subdivision, Planning, Property Surveys, Topo-
graphic Surveys, Reports, Appraisals.
2607½ No. High St. Columbus 2, Ohio
AM 2-9744**NORMAN O. ELDRED***Consulting Engineer*Water Supply and Distribution Systems, Munic-
ipal and Industrial Water Conditioning Equip-
ment, Steam Power Plants, Diesel-Electric Power
Plants, Electric Systems, Street Lighting, Pav-
ments, Airports, Drainage, Sewage Treatment,
Trade Wastes Disposal, Municipal Incinerators,
Industrial Plant Designs, Propane & Butane
Storage & Vaporizer Plants.
P.O. Box 3396 Merchandise Mart Postal Sta.
Chicago 34, Illinois**ROY B. EVERSON**Water Treatment Service Since 1900 for Swim-
ming Pool Circulating Systems. Purification Sys-
tems as applied to Sewage Treatment and Water
Works. A New System for Automatic Control.

237 W. Huron Street, Chicago 10, Ill.

**FAY, SPOFFORD &
THORNDIKE, INC.***Engineers*Airports — Bridges — Express Highways
Industrial Bldgs.—Incinerators—Port Developments
Water Supply — Drainage and Sewerage Systems
11 Beacon Street, Boston, Mass.**FINKBEINER, PETTIS & STROUT***Consulting Engineers*Water Supply, Water Treatment,
Sewerage, Sewage Treatment,
Bridges, Highways & Expressways

2130 Madison Avenue Toledo 2, Ohio

WALTER H. FLOOD & CO.*Chemical Engineers*Inspection and Testing of Materials and Structures
Streets — Roads — Airports
Building and General Engineering Construction
Resident Inspection — Chemical & Physical Tests
Soil Boring & Investigation—Concrete Core Cutting
Specifications — Reports — Research
6102 S. Blackstone Ave. Chicago 37, Ill.**FRIDY, GAUKER,
TRUSCOTT & FRIDY, INC.***Engineers*Hospitals, Schools, Industrial Buildings,
Public Buildings, Airports, Roads, Water,
Sewage, Petroleum Facilities, Waste Dis-
posal, Power & Lighting, Reports, Plans,
Supervision, Appraisals.
1321 Arch Street Philadelphia 7, Penna.**M. E. FRYE & ASSOCIATES, INC.***CONSULTING ENGINEERS*Investigations • Reports
Civil, Sanitary & Municipal Engineering
Planning • Designs • Supervision428 Blvd. of Allies 166 E. Union St.
Pittsburgh 19, Pa. Somerset, Pa.
EXpress 1-0818 50 Somerset 6366**GILBERT ASSOCIATES, Inc.***Engineers and Consultants*Power Plant Engineering
Water Supply and Purification
Sewage and Industrial Waste Treatment
Chemical Laboratory Service

New York READING, PA. Washington

FOR RATES FOR THIS SPACE

write

PUBLIC WORKS MAGAZINE

200 So. Broad St. Ridgewood, N.J.

GREELEY & HANSEN*Engineers*Water Supply, Water Purification
Sewerage, Sewage Treatment
Flood Control, Drainage, Refuse Disposal

14 East Jackson Blvd., Chicago 4, Illinois

HOWARD R. GREEN CO.*Consulting Engineers*DESIGN AND SUPERVISION OF
MUNICIPAL DEVELOPMENTS
Water Works and Treatment—Sewers
and Sewage Disposal—Investigations
and Valuations
208-10 Beaver Bldg., Cedar Rapids, Iowa
Established 1913fall, with bounding dates are as fol-
lows:

Auburn, 1881 to 1957, 28.44 ins. in 1954; 29 days without rain from Oct. 31 to Nov. 28, 1917. Dothan, 1925-1957, 28.96 ins. in 1954; 44 days without rain from Sept. 30 to Nov. 12, 1939. Greensboro, 1855 to 1867 and 1885 to 1957; 29.00 ins. in 1954; 38 days without rain, Aug. 29 to Oct. 5, 1922. Montgomery, 1873 to 1957; 26.82 ins. in 1954; 55 days without rain, Sept. 8 to Nov. 1, 1904. Selma, 1892 to 1957; 30.00 ins. in 1954; 54 days without rain, Sept. 29 to Nov. 22, 1924. Talladega, 1897 to 1957; 34.06 ins. in 1954; 54 days without rain, Sept. 28 to Nov. 21, 1954. Troy, 1908 to 1957; 24.41 ins. in 1954; 24 days without rain, Oct. 3 to 26, 1953. Tuscaloosa, 1881 to 1957; 32.87 ins. in 1954; 52 days without rain, Sept. 13 to Nov. 4, 1891.

It will be noted that, though 1954 was the year of lowest annual rainfall at all of these stations, none of the very long low-rainfall periods occurred in that year. In fact, the longest period without rain at any of these stations in 1954 was 19 days, in October.

The mean annual rainfall at Tuscaloosa for the 77 years from 1881 to 1957 amounts to 52.5 ins., but a rainfall as high as 81.5 ins. occurred in 1929 and as low as 32.87 ins. in 1954. These represent values of departures from the mean of +55 and -37 percent, which are fairly typical of many areas in the state. The year 1904 had a rainfall nearly as low as that of 1954.

• • •

Emergency Services*(Continued from page 115)*

pre-attack planning, post-attack operations, organization of clearance and restoration forces, basic requirements for debris clearance in a civil defense emergency, and road clearance operational patterns for bombed critical target areas. Although it deals with the effects of a nominal bomb, much of the material is applicable to thermonuclear weapons.

An important resource for debris clearance operations is the Associated General Contractors of America, whose disaster plan, known as "Plan Bulldozer," should be integrated into the community's emergency plan. Participation in the plan is open to all contractors, whether they are AGC members or not. Under the plan, any contractor or subcontractor who has engineering equipment or technical knowledge, or who em-

WILLIAM F. GUYTON AND ASSOCIATES

Consulting Ground-Water Hydrologists

Underground Water Supplies
Investigations, Reports, Advice
307 W. 12th St., Austin 1, Texas
Phone: GR 7-7165

GWIN ENGINEERS, INC.

Consulting Engineers

Highways Water Supply
Municipal Sewage Disposal
Planning Mapping
Reports, Design, Supervision of Construction,
Surveys
1200 12th Ave. Altoona, Pa.

HARDESTY & HANOVER

Consulting Engineers

Long Span and Movable Bridges, Hanover
Saw Bascule, Grade Eliminations, Foundations,
Expressways and Thruways, Other Structures,
Supervision, Appraisals, and Reports
101 Park Avenue, New York 17, N.Y.

HAVENS AND EMERSON

A. A. Burger H. H. Moseley
J. W. Avery F. S. Polocoy
E. S. Ordway G. H. Abplanalp
A. M. Mock S. H. Sutton
Frank C. Tolles, Consultant
Consulting Engineers
Water, Sewerage, Garbage, Industrial Wastes,
Valuations—Laboratories
Leader Bldg. Woolworth Bldg.
Cleveland 14, O. New York 7, N.Y.

FOR RATES FOR THIS SPACE

WRITE

PUBLIC WORKS MAGAZINE

200 So Broad St., Ridgewood, N.J.

HAZEN AND SAWYER

Engineers

Richard Hazen Alfred W. Sawyer
H. E. Hudson, Jr.
Water and Sewerage Works
Industrial Waste Disposal
Drainage and Flood Control
360 Lexington Ave., New York 17, N.Y.

HENNINGSON, DURHAM & RICHARDSON, INC.

Consulting Engineers

Consulting Engineers since 1917 for
more than 700 cities and towns
Water Works, Light and Power, Sewerage,
Paving, Airports, Reports,
Appraisals, Drainage
2962 Harney St. Omaha 2, Nebr.

HILL & HILL

Engineers

Sewage and Waste Disposal,
Water Supply and Filtration,
Dams, Reservoirs, Tunnels,
Airport and Topographic Surveys
Home Office: 8 Gibson St., North East, Pa.

HAROLD HOSKINS & ASSOCIATES

Consulting Engineers

Sewers and Sewage Treatment
Paving Water Supply Drainage
Bridges Airports Reports
Aerial Photogrammetry
Power Plants Surveys
1630 Que St., Lincoln 8, Nebr.
1018 Eighth Avenue, Greeley, Colorado

MARK HURD AERIAL SURVEYS, INC.

Topographic And Planimetric Maps Tax Maps Aerial Photography

230 Oak Grove Street Minneapolis 3, Minn.

Jenkins, Merchant & Nankivil

Consulting Engineers

Municipal Improvements Gas Systems
Highways & Airports Water Systems
Power Development Sewerage Systems
Traffic Surveys Industrial Plants
Flood Control Recreational Facilities
Investigations and Reports
801-805 East Miller St., Springfield, Ill.

JOHNSON DEPP & QUISENBERRY Inc.

Consulting Engineers

Highways Water Supply
Planning Sewage Disposal
2625 Frederica St. Owensboro, Ky.

JOHNSON SOILS ENGINEERING LABORATORY

Laboratory and Field Testing
Shear and Consolidation Tests
Design and Construction Control

MOBILE LABORATORIES

193 West Shore Avenue
Bogota, New Jersey

JONES HENRY & WILLIAMS

Consulting Sanitary Engineers

Water Works
Sewerage and Treatment
Waste Disposal
2000 West Central Avenue Toledo 6, Ohio

EDWARD C. JORDAN CO., INC.

Civil & Sanitary Engineers

Sewerage • Sewage Disposal • Industrial Wastes
Drainage • Water Supply • Streets • Highways
Municipal Engineering
Investigations—Reports—Designs—Supervision
379½ Congress St., Portland, Maine
Tel. SP. 4-0315

KAIGHIN AND HUGHES

Engineers

INDUSTRIAL WASTES DIVISION
E. B. BENSELVIERE, MGR.
Study - Design - Equipment -
Construction
1080 Atlantic Ave. Toledo 1, Ohio

KENNEDY ENGINEERS

Complete Public Works Engineering

- Water Supply
- Sewage and Waste Treatment
- Sewage Reclamation
- Utilities Planning

**CHEMICAL and BIOLOGICAL LABORATORY
SAN FRANCISCO**
Los Angeles Tacoma Salt Lake City

KEIS & HOLROYD

Consulting Engineers

(Formerly Solomon & Keis)
Since 1906
Water Supply, Sewage Disposal, Garbage &
Refuse Incineration, Industrial Buildings
Troy, N.Y.

FENTON G. KEYES ASSOCIATES

Consulting

ARCHITECT-ENGINEERS

Providence 3, R.I. Waltham 54, Mass.

KOEBIG & KOEBIG, INC.

ENGINEERING — ARCHITECTURE MUNICIPAL PLANNING

Reports Investigations Designs
Consultants to Cities Since 1910
3242 W. 8th Street, Los Angeles 5, California
715 Bank of America Building,
625 Broadway, San Diego, California

MORRIS KNOWLES INC.

Engineers

Water Supply and Purification, Sewage
and Sewerage Disposal, Industrial Waste,
Valuations, Laboratory, City Planning
1312 Park Building, Pittsburgh 22, Pa.

DANIEL KOFFLER AND ASSOCIATES

Consulting Engineers

Structural, mechanical and sanitary engineering
Bridges, special structures, cold storage ware-
housing, industrial developments, parking garages
and airplane hangars.
Dupont Blvd. and Washington Ave.
New Castle, Del.

KREHBIEL & KREHBIEL engineers



Consulting

DRAINAGE REPORTS
HIGHWAYS SEWERAGE
ICE RINKS SUBDIVISIONS
PLANNING SURVEYS
POOLS WATER

1868 NIAGARA FALLS BOULEVARD • TONAWANDA, N. Y.

LADD ENGINEERING CO.

Consulting Engineers

Sewers, Water, Paving,
Filter Plants, Disposal Plants,
Electric Systems
Southeastern States
Home Office: PORT PAYNE, ALA.

LOZIER CONSULTANTS, INC.

Engineers

Sewerage, Sewage Disposal, Water
Supply, Water Purification, Refuse
Disposal
10 Gibbs Street Rochester 4, N.Y.

EMMET J. McDONALD & ASSOCIATES

CONSULTING ENGINEERS

HIGHWAYS, MUNICIPAL, SURVEYS
ELECTRONIC COMPUTATIONS
55 E. Cuyahoga Falls Ave. Akron 10, Ohio

GEORGE B. MEBUS, INC.

Consulting Engineers

Sewerage — Industrial Wastes
Water Supply — City Planning
Investigations and Reports
Design and Supervision of Construction
Valuations
Broad Street Trust Co., Bldg.
Glenside, Pa.

MERRITT & WELKER*Engineers*

Water, Sewage, Streets, Roads, Natural Gas,
Valuations, Municipal Planning

208 Roswell Street Marietta, Georgia

FOR RATES FOR THIS SPACE*writes***PUBLIC WORKS MAGAZINE**

200 So. Broad St. Ridgewood, N.J.

METCALF & EDDY*Engineers*

Water, Sewage, Drainage, Refuse and
Industrial Waste Problems
Airports Laboratory Valuations

Starler Building
Boston 16

**MORAN, PROCTOR, MUESER
& RUTLEDGE***Consulting Engineers*

Foundations for Buildings, Bridges and Dams;
Tunnels, Bulkheads, Marine Structures;
Soil Studies and Tests, Reports,
Design and Supervision

415 Madison Ave. New York 17, N.Y.
Eldorado 5-4888

GEORGE V. R. MULLIGAN, P.E.*Management Consultant*

Operation Analysis
Manpower Utilization
Management Controls

401-19th Street, N.W. Washington, D.C.

NUSSBAUMER-CLARKE and VELZY*Consulting Engineers*

Sewage Treatment—Water Supply
Incineration—Drainage—Highway Planning
Appraisals and Rate Studies

327 Franklin St., Buffalo 2, N.Y.
500-5th Ave., New York 36, N.Y.

O'BRIEN & GERE*Consulting Engineers*

Water Supply, Treatment, and Distribution
Sewage and Sewage Treatment
Industrial Waste Treatment—Flood Control
and Drainage

Rate Studies—Development Planning—Surveys
400 East Genesee Street Syracuse 2, N.Y.

**PARSONS, BRINCKERHOFF
QUADE & DOUGLAS***Civil and Sanitary Engineers*

Water, Sewage, Drainage and
Industrial Waste Problems.
Structures—Power—Transportation

165 Broadway New York 6, N.Y.

MALCOLM PIRNIE ENGINEERS

Malcolm Pirnie
Ernest W. Whitlock
Robert D. Mitchell

Carl A. Arenander
Malcolm Pirnie, Jr.
Alfred C. Leonard

MUNICIPAL AND INDUSTRIAL

Water Supply — Water Treatment
Sewage and Waste Treatment
Drainage — Rates — Refuse Disposal

23 West 43rd St. New York 36, N.Y.

THE PITOMETER ASSOCIATES, INC.*Engineers*

Water Waste Surveys
Trunk Main Surveys
Water Distribution Studies
Water Measurement and Special
Hydraulic Investigations

50 Church St., New York City

PRAEGER-KAVANAGH*Engineers*

128 E. 38th St. New York 16, N.Y.

RADER AND ASSOCIATES*Engineers—Architects*

Water Works, Sewers, Sewage Disposal and
other Public Works Projects, Hotels, Office,
Industrial and Commercial Buildings
Plans, Specifications, Supervision, Reports
Investigations, Consultations
Aerial Photography, Photogrammetry
The First National Bank Bldg., Miami 32, Florida
Phone Franklin 1-3551

**ROY EDWIN RAMSEIER
AND ASSOCIATES***Sanitary and Hydraulic Engineers*

Water Supply, Treatment, Distribution
Sewage and Sewage Treatment
Chemical and Bacteriological Laboratories

1539 Solano Avenue, Berkeley 7, California

DALE H. REA*Consulting Engineers*

Water Supply and Treatment, Sewage Col-
lection and Treatment, Irrigation, Reservoirs
and Dams, Airports, Buildings and Bridges
Appraisals — Reports — Specifications
Supervision of Construction

2200 West Chenoango Littleton, Colorado
PY. 4-3546

FOR RATES FOR THIS SPACE*writes***PUBLIC WORKS MAGAZINE**

200 So. Broad St. Ridgewood, N.J.

RIPPLE AND HOWE, Inc.*Consulting Engineers*
**APPRAISALS AND REPORTS
DESIGN AND SUPERVISION**

Water Works Systems, Filtration Plants,
Irrigation and Drainage Systems, Reser-
voirs and Dams, Sanitary and Storm Sewer
Systems, Sewage Treatment Plants, and
Refuse Disposal.

O. J. Ripple V. A. Vossan B. V. Howe
833 23rd St. Denver 5, Colo.

RUSSELL AND AXON*Consulting Engineers*

Civil—Sanitary—Structural
Industrial—Electrical
Rate Investigations

408 Olive St., St. Louis 2, Mo.
Municipal Airport, Daytona Beach, Fla.

CARL SCHNEIDER*Consulting Engineers*

Incineration Sanitary Pills
Refuse Collection Sanitation Studies
Reports

602 Pan American Bldg.
New Orleans 12, La.

plays skilled workmen may make these resources known to a central organization of the association and available for disaster relief operations. Upon notification by local government authorities that normal means of disaster relief and control are inadequate, local AGC organizations will put "Plan Bulldozer" into effect, committing personnel and equipment to needy areas. In the event of disaster on a nationwide scale, resources would naturally be insufficient for the needs of all communities affected and a system of priorities would be needed.

Road Repair

The repair of roads, streets, highways, and airports will also be the responsibility of the public works department. Emergency operating plans and procedures should include an expanded organization chart showing additional manpower requirements for 24-hour operation. Resources required to put the plan into effect should be included. Public works personnel used in debris clearance operations can also be used as a nucleus for road repair operations. In this area, too, use should be made of "Plan Bulldozer."

Thought should be given to the use of prefabricated "Bailey" bridges for important routes. Essential roads and airports must be repaired as quickly as conditions permit, using materials from local sources where possible. Durable surfacing materials, such as blacktop and high early-strength concrete must be used wherever heavy traffic will require it. Adequate detours and by-passes will be needed for roads that have been badly damaged in spots.

Problems such as these emphasize the need for developing emergency plans or standard operating procedures for areas of public works services. These "SOP's" are in effect blueprints which detail specific actions to be taken in emergencies and tell who does what, when, where, and how. To have purpose and validity, they must be completely operational and fully integrated into community survival plans. These, in turn, must be implemented into local government to achieve any degree of effectiveness.

Civil defense emphasis is on preparedness. Every community should develop a versatile readiness capability for emergency situations. It may not be possible to avoid natural or man-made disasters, but their effects often can be greatly minimized by the farsighted planning of competent, informed public works officials.

IRBY SEAY COMPANY**Engineers—Consultants**

Water Supply & Treatment Natural Gas Systems
Sewage System & Treatment Electrical

516 Goodwyn Inst. Bldg. Phone JAckson 7-2932
Memphis, Tennessee

SEELYE STEVENSON VALUE & KNECHT**Consulting Engineers**

Richard E. Dougherty, Consultant
Civil, Mechanical, Electrical
Airports, Highways, Bridges, Industrial
Plants, Dams, Water Supply, Sanitation,
Tunnels, Piers, Reinforced Concrete, Steel
101 Park Avenue New York 17, N.Y.

SERVIS, VAN DOREN & HAZARD**Engineers—Architects**

Construction • Appraisals

Investigations • Design • Supervision of
Water • Sewage • Streets • Expressways • High-
ways • Bridges • Foundations • Airports • Flood
Control • Drainage • Aerial Surveys • Site Plan-
ning • Urban Subdivisions • Industrial Facilities
Electrical • Mechanical
2910 Topeka Blvd. Topeka, Kansas

SMITH & GILLESPIE**Municipal and Consulting Engineers**

Water Supply, Water Purification
Sewerage, Sewage Disposal, Drainage
Refuse Disposal, Gas Systems, Power Plants
Airports

Jacksonville Florida

FOSTER D. SNELL, Inc.

29 West 15th St., New York 11, N.Y.

WAtkins 4-8800

Chemists, Engineers, Bacteriologists,
Toxicologists, Market Research,
10 stories of laboratories with
a staff of over 130.

YOUR INQUIRY ANSWERED PROMPTLY

SOIL TESTING SERVICES, INC.**Consulting Engineers**

CARL A. METZ JOHN P. GNAEDINGER
Soil Investigations
Foundation Recommendations and Design
Laboratory Testing

1827 No. Harlem Ave. Chicago 35, Ill.
San Francisco Milwaukee, Wis.
Havana, Cuba Portland, Michigan

SPRAGUE & HENWOOD, INC.**Drilling Services**

Foundation Investigations Test Boring
Grease Hole Drilling and Pressure Grouting
Diamond Core Drilling

221 W. Olive St., Scranton, Pa.
New York, Philadelphia, Pittsburgh, Nashville
Grand Junction, Colorado
Buchans, Newfoundland

FOR RATES FOR THIS SPACE

Write

PUBLIC WORKS MAGAZINE

380 So. Broad St., Ridgewood, N.J.

STANLEY ENGINEERING COMPANY**Consulting Engineers**

Hershey Building Muscatine, Iowa
308 S. LaSalle St. Chicago 4, Illinois
1154 Hanna Building Cleveland 15, Ohio

ROBERT H. STELLWAGEN**Consulting Engineer**

Municipal and Industrial Waste Problems
Collection, Incineration, Salvage, Pumping,
Treatment, Testing

1442 E. Outer Drive Detroit 34, Mich.

ALDEN E. STILSON & ASSOCIATES**Consulting Engineers**

Water Supply, Sewerage, Industrial Waste
Bridges—Highways—Industrial Structures
Mechanical & Industrial Layouts & Studies
Land Use Planning & Industrial Parks
345 N. High St. 75 Public Square
Columbus, Ohio Cleveland, Ohio

STETSON, STRAUSS & DRESSSELHAUS, INC.**Civil & Consulting Engineers**

Los Angeles Oceanside Porterville
Water Supply, Drainage, Sewerage, Municipal
Works Foundations, Materials Testing, Surveying
& Mapping Investigations, Reports, Designs,
Estimates
Main Office: 219 W. 7th St., Los Angeles, Calif.

SUHR, PETERSON, PETERSON & SUHR**Consulting Engineers****REPORTS—PLANS—SUPERVISION**

Sewerage, Water Supply, Flood Control
and Drainage, Airports, Roads, Surveys,
Fixed and Movable Bridges.

138 N. Wells St. Chicago 6, Illinois

FOR RATES FOR THIS SPACE

write

PUBLIC WORKS MAGAZINE

200 So. Broad St. Ridgewood, N.J.

WALLACE & HOLLAND**Consulting Engineers**

MUNICIPAL SANITARY STRUCTURAL
Streets Pollution Control Bridges
Airports Swimming Pools Buildings
Planning Storm Drainage Storage Bins
Expressways Water Supply Investigations
401 North Federal Avenue, Mason City, Iowa

JOSEPH S. WARD**Consulting Soil and Foundation Engineer**

Site Investigation, Boring Supervision, Labora-
tory Soils Testing, Foundation and Pavement
Analysis and Design, Construction Supervision,
Engineering Reports and Consultation.

91 Roseland Avenue Caldwell, N.J.

FOR RATES FOR THIS SPACE

write

PUBLIC WORKS MAGAZINE

200 So. Broad St. Ridgewood, N.J.

J. STEPHEN WATKINS

J. S. Watkins G. R. Watkins

Consulting Engineers

Municipal and Industrial Engineering, Water
Supply and Purification, Sewerage and Sewage
Treatment, Highways and Structures, Reports,
Investigations and Rate Structures.

446 East High Street Lexington, Kentucky
Branch Office
4726 Preston Highway Louisville, Kentucky

WEINBERG & CUNNINGHAM**Engineering Consultants**

Water Supply, Treatment & Distribution
Sewage Treatment & Disposal
Industrial Waste Treatment
Investigations, Reports, Appraisals, Rates, General
Public Works Engineering
Foundations
Highway & Traffic
Industrial & Municipal
Buildings

134 EAST THORNTON ST., AKRON 11, OHIO

MARION C. WELCH**Consulting Engineer**

Water Supply Sewerage Swimming Pools
101 East High Street Lexington, Ky.
Phones: 2-5119 & 7-3405

ROY F. WESTON, INC.**ENGINEERS—BIOLOGISTS—CHEMISTS**

Industrial Wastes—Stream Pollution
Air Pollution—Water Sewage
Surveys—Research—Development—Process
Engineering—Plans and Specifications
Operation Supervision—Analysis
Evaluations and Reports
NEWTOWN SQUARE, PA.

WALTER H. WHEELER EM., M. A. S. C. E.**Designing and Consulting Engineer**

Buildings, Bridges, Mfg. Plants, Etc.
Inventor "Smooth Ceilings" Flat Slab
Construction

802 Met. Life Bldg. Minneapolis, Minn.
Tel. Federal 3-1019

WHITMAN, REQUARDT and Associates

Civil—Sanitary—Structural
Mechanical—Electrical
Reports, Plans, Supervision, Appraisals

1304 St. Paul St., Baltimore 2, Md.

CLYDE E. WILLIAMS & ASSOCIATES, INC.

Aerial Mapping
Civil & Sanitary Engineering

312 W. Colfax Ave., South Bend 1, Ind.
728 E. 38th St., Indianapolis 5, Ind.

WILSEY, HAM & BLAIR**Engineers & Planners**

Water and Sewage Works
Flood Control and Drainage
Airports, Traffic Studies and Bridges
City and Regional Planning

111 Rollins Road, Millbrae, Calif.
860 W. Colorado Blvd.,
Los Angeles 41, Calif.

WILSON & COMPANY**Engineers**

Water, Sewerage, Streets, Highways, Dams,
Bridges, Electrical, Airfields, Drainage,
Treatment Plants, Industrial Installations,
Chemical Testing Lab — Aerial Mapping
Electronic Computer Services

631 E. CRAWFORD SALINA, KANSAS

J. C. ZIMMERMAN ENGINEERING CO.**Consulting Engineers**

Water Supply and Treatment
Drainage — Flood Relief
Sewerage and Sewage Treatment
Planning Design Supervision
11121 West Oklahoma Avenue
West Allis 19, Wisconsin

PUBLIC WORKS EQUIPMENT NEWS



Storage Tank

A water storage tank, the "Cylindroid," is designed to meet a critical need among growing communities for a low-cost ground-level reservoir which can be built to any capacity to serve present and future requirements. The tank uses light steel; requires a minimum of shop forming and prefabrication; can be

erected on the site with a small crew and light equipment; and can be easily screened with trees and landscaping in residential areas.

Graver Tank & Mfg. Co., East Chicago, Ind.

Circle No. 8-1 on the convenient reply card facing page 34.

Coated Fibre Pipe

A root-proof and perforated fibre pipe, new Klean-Kote Orangeburg fibre pipe has a tough, non-brittle, sealed protective coating for clean and safe handling in transit, storage or installation. The root-proof and perforated fibre pipe is used in septic

tank connections, house-sewers, storm-drains and other outdoor, underground non-pressure installations.

Orangeburg Mfg. Co., Div. of Flintkote Co., 30 Rockefeller Plaza, New York 20, N. Y.

Circle No. 8-2 on the convenient reply card facing page 34.

Disk Harrow



Designed for installation on Caterpillar No. 12 and No. 14 motor graders, the Rome disk plowing har-

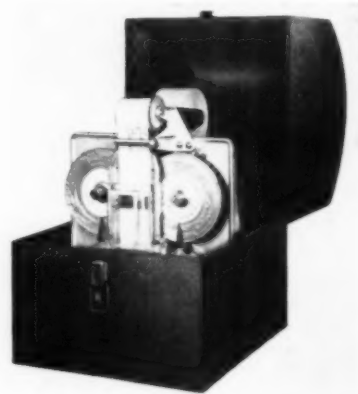
row is mounted by springloaded lift links attached to the motor grader's blade and scarifier lift arms, giving the operator complete control over the harrow's position and penetration. A 16 disk model with 12-in. disk spacing is used to scarify, mix and blend, aerate, and pulverize materials in road construction and in maintenance of unpaved roads. Another model, with 22 disk blades spaced 6-in. apart, is designed especially for maintenance of oil roads.

Rome Plow Company, Cedartown, Georgia.

Circle No. 8-3 on the convenient reply card facing page 34.

Traffic Recorder

A traffic recorder that produces a punched-tape record for translation into punched-card form, the "Traffic Operation Punch" maintains a running total of traffic and records the total on a binary coded paper tape every 15, 30, or 60 minutes. The tape can be converted into punched cards, punched computer tape, or typewritten form with an F&P translator, completely eliminating manual data handling. A month's readings recorded at 15-minute intervals can be translated into punched cards in about 15 minutes. The recorder accepts signals from any type of detecting element, such as a treadle,



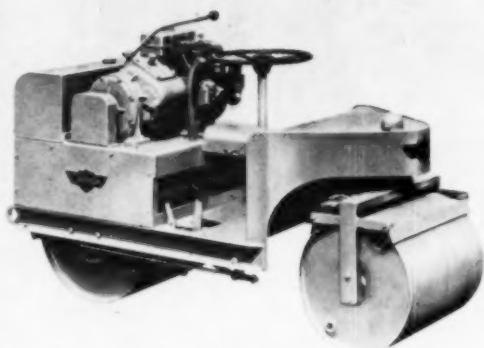
or sonic detector. The traffic counter is available in both portable and permanent models. The portable model is powered by a six-volt dry cell battery, total weight 40 pounds. The battery will last one year at 15-minute readout intervals. The portable unit is encased in a hinged steel case. The permanent unit is mounted on a sliding mechanism that allows the unit to be installed in a standard type of traffic enclosure. It contains its own rectifier and will operate on standard 110-volt power. Both models can hold a year's supply of tape at 15-minute readout intervals.

Fischer & Porter Co., 552 Jacksonville Rd., Warminster, Pa.

Circle No. 8-4 on the convenient reply card facing page 34.

Tandem Rollers

Refuse Body



Model incorporates large heavy-duty rollers for service.

The Essick Model 120, one ton tandem roller, features a low profile, wide rolls, visibility of the area ahead, positive steering combined with rugged construction, and a maximum working weight of 2070 lbs. The roller is lifetime lubricated with a fully exposed engine and transmission, to provide for bench servicing, a short wheel base for short turning radius, and new departure compression roll bearings. Easily transported, this roller is ideal for soil, asphalt or turf compaction. The Model 220 1½ to 2 ton tandem

roller offers over-all visibility and long life with an automotive-type brake located on the compression roll. Large, wide rolls and a low center of gravity give the roller stability. Features include constant-mesh transmission, with readily accessible clutches, heavy duty roller chain and sprockets on the final drive, plus lifetime lubricated bearings.

Essick Manufacturing Company, 1950 Santa Fe Avenue, Los Angeles 21, California.

Circle No. 8-5 on the convenient reply card facing page 34.



The 18-cubic yard unit is installed on two-ton chassis.

The Truxmore Pakker is manufactured in two sizes, 18 cu. yd. and 23 cu. yd. A hydraulic loading device for detachable containers up to two cu. yd. is available. The unit is cylindrical in design with a rear door that holds nearly three cu. yd. and is fully hydraulic, using a telescopic ram and packer blade for compacting the rubbish within the cylindrical body. The loading height is 15 in. from the top of truck frame to top of the loading door. The rear door is opened by the truck operator standing beside the truck. 23 cubic yards of compressed rubbish can be carried on 2, 2½ and 3 ton trucks. The same blade that compresses the rubbish also discharges the rubbish at the dump.

Truck Equipment Corp., Richmond, Va.

Circle No. 8-8 on the convenient reply card facing page 34.

Danger Flags

This line of fluorescent danger flags for street, highway and plant use are brilliant flame red and provide high visibility, assurance of being seen at a distance, protection to work crews and to foot and mobile traffic in the area. The fluorescent vinyl is permanently bonded to both sides of the nylon base fabric. They are being offered in styles and sizes for use on sign and flag standards, barricades, traffic cones, trucks.

Albert W. Pendergast Safety Equipment Company, Tulip & Longshore Sts., Philadelphia 35, Pa.

Circle No. 8-6 on the convenient reply card facing page 34.

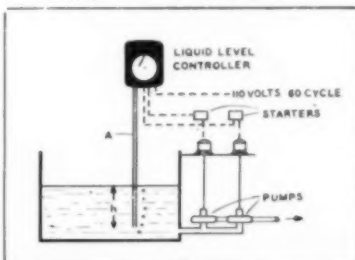
Level Control

Using the bubble tube method of measuring level, the "packaged" control unit for use in industrial processing and in water and sewage treatment plants, features ±0.5 percent accuracy and ranges from 0-10 in. up to 0-10 ft. of water. The controller consists of a compressor, a purge rotameter, diaphragm pressure element, damping restrictor,

Rotax contacts, plug-in relays and a pump sequencing relay. It can be furnished as an indicator, a recorder, or a telemeter transmitter. All components are housed in a single instrument case, to which a bubble tube is connected. In operation, the compressor forces just enough air through the immersed bubble tube to assure continuous escape of the bubbles. As the level of the measured liquid changes, the diaphragm reflects a corresponding change in back pressure in the tube and positions the instrument pen or pointer.

The Foxboro Company, Foxboro, Mass.

Circle No. 8-7 on the convenient reply card facing page 34.



Instrument requires no cleaning or servicing and is simple to install.

Truck Body

This garbage and rubbish collection body is loaded by collection men through a large opening in the rear. The opening is low, requiring minimum lifting by collection crews. Push button controls operate the hydraulic mechanism which compresses the refuse into the body. In addition, the Colectomatic Mark II can be equipped to empty refuse containers and automatically compress the refuse into the truck body. The center of gravity during unloading cycles eliminates tendencies of front wheels to raise off ground, or for truck to tip sideways, when on uneven or soft ground at disposal areas.

The Heil Co., Milwaukee, Wisconsin.

Circle No. 8-9 on the convenient reply card facing page 34.



Eliminates many exploratory excavations.

Faultfinder

Specifically designed for maintenance of municipal and state electrical installations, the Faultfinder is a combination ground detector and fault finder. It locates accidental grounds on energized power systems without shutdown and is easily operated by one man for location of overhead pipe, line and cable signals and buried circuits without climbing or excavating. This detection is done on power systems (both AC and DC) up to 600 volts. The Faultfinder imposes only two amperes on the circuit and does not interfere with output. Portable model includes cabinet, exploring cord and extension pole. Double earphones with foam rubber covering assist in hearing loud and clear signals. The unit weighs only 18 pounds and has no delicate meters to read or adjust.

Parr Manufacturing Corporation,
44 Austin Street, Newark, N. J.

Circle No. 8-10 on the convenient
reply card facing page 34.

Warning Light

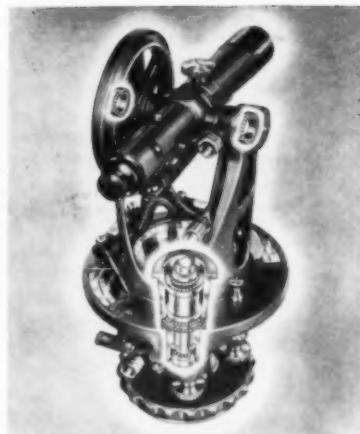
This Dietz No. 211 emergency warning light, designed primarily for use on ambulances, police cars, service trucks, school buses, fire trucks, or government vehicles, can be obtained in numerous light patterns and colors. Inside its plastic lens are four sealed beam bulbs which revolve continuously, driven by a motor and gear train assembly housed in the unit's chrome-plated brass base. By using different combinations of bulbs, either one, two, three or four respectively, the frequency of the beam patterns can be set at 30, 60, 90 or 100 light impulses per minute. Overall height of the fixture, including a thick, soft-rubber mounting pad that protects the base, is 8¾ inches. Lens height is 5¾ inches. Body diameter: 11-inches. The lens can be removed by merely loosening one brass bolt. Unit is factory assembled for use with either six or twelve volt bulbs. Lenses are available in amber, red, half amber and half red, blue or clear, and offer large area without high protrusion above roof.

R. E. Dietz Company, 225 Wilkinson Street, Syracuse 1, New York.

Circle No. 8-11 on the convenient
reply card facing page 34.



Emergency light provides effective
protection for maintenance vehicles.



Accurate in wide temperature range.

Engineer's Transit

The Brunson Engineer's Transit Model 50 is a precision instrument featuring securely sealed, permanently lubricated ball bearing construction for lasting accuracy under all climatic conditions. The axes of the transit are completely protected from dust and moisture. Vertical and horizontal circles are engine-divided, precision cut graduations on sterling silver. They are flush-filled with non-reflective black enamel to reduce parallel reading errors. The 5-inch diameter vertical circle, graduated to 30 minutes, has a double vernier which reads to 1 minute. The 6¼-inch diameter horizontal circle verniers also read to 1 minute. The 22X power, internal focus, erecting image, 10½-inch telescope has a minimum focus of 3½ feet from axis to target. The 14½ pound transit is finished with a gray enamel.

Charles Bruning Company, Inc.,
Mount Prospect, Illinois.

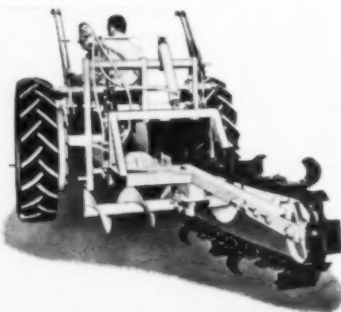
Circle No. 8-13 on the convenient
reply card facing page 34.

Power Ditcher

The 3P Pow-R-Ditcher is specifically designed to fit all 3-point tractor hitches. Built for contractors, municipalities, utilities and custom operators, the ditcher is quickly attached and capable of digging a wide variety of trenches. It has a digging width of 6 to 16 in. and a 4½ ft. depth. The tractor-mounted ditcher features an hydraulically actuated travel ratchet device that gives control of digging speed from one control lever. The power is taken from the tractor's hydraulic system. The PTO shaft is equipped with a double disc friction slip clutch for digging safety.

Vermeer Mfg. Co., Pella, Iowa.

Circle No. 8-12 on the convenient
reply card facing page 34.



Brush Filament

This polyolefin brush filament used on the sweeper roller is oval in shape and 26 inches in length. Each length is stapled by cables to the grooved roller, making the individual bristle 13 inches. "Wynene 18" brush bristles are inert and moisture resistant, have high tensile strength, retain their rigidity at above-boiling temperatures and resist solvents, oils, grease and most acids. Bristles are available in both level and crimped strands.

The National Plastic Products Company, Odenton, Maryland.

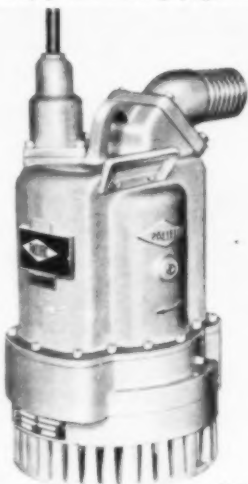
Circle No. 8-14 on the convenient
reply card facing page 34.

Contractor's Pump

This submersible contractor's pump, type SA, is designed to simplify dewatering problems. It is always primed. Suction hose is eliminated. To operate, just lower it into the water, plug in the cables, attach the discharge hose, and turn the start knob. It will pump whatever water comes in, even if it is only 5% of the pump's capacity. It operates in muddy water or sludge, under flood or semi-dry conditions, in hot or freezing climate. Water discharge passes along the side of the motor, cooling the specially insulated windings. Motor ball bearings are lifetime lubricated. Pressurized double seal runs in oil, protecting it from grit and abrasion. The rubber-lined pump case and a special tough alloy impeller are resistant to wear of abrasives and mud. Light weight alloy casing resists action of salt water, and erosive or contaminated water.

Pacific Pumping Company, P. O. Box 44, Oakland, California.

Circle No. 8-15 on the convenient reply card facing page 34.



© 1800-43A

Designed to simplify dewatering problems by elimination of suction hoses.

Transistorized Radio

The 100-watt mobile radio, available in low band frequencies, (25 to 50 mc.) is a transistorized unit packaged in a case four in. high, 8 3/8 in. wide and 15 in. long. The small size permits the complete unit to be mounted under the dash in most cars and trucks. However, the unit is designed in two sections to facilitate mounting in trunks, under seats, and in various other parts of the vehicle. The equipment draws 1.75 amperes when "on" and

ready to transmit. Standby drain (ready to receive a message) is 40 milliamperes using a 2-watt speaker. This enables a driver to turn his vehicle's engine off and still hear his radio without installing special equipment to eliminate battery problems.

General-Electric Communication Products Department, P. O. Box 4197, Lynchburg, Va.

Circle No. 1-16 on the convenient reply card facing page 34.



Complete unit mountable under dash of vehicle to simplify installation work.

Repair Kit

A portable repair kit is designed for simple, economic, and rapid permanent repairs to pipe and tubing, pipe joints, pipe fittings, and tanks and other vessels. The epoxy resin utility repair kit, the "Util-Seal," doubles as a carrying case, and is small enough to be carried as spare gear on all service trucks. Leaking bell and spigot joints, flanges, saddles, and caulked sleeves, as well as cracked valve bonnets and leaking threads can be repaired by ordinary labor in a minimum of time with this kit. The package contains individual portions of resin, activator and fibrous reinforcer, as well as a collector ring and pressure relief vents for use during the "setting-up" period. The material can be mixed in the field in the resin can supplied in the package; stirred and applied with a wooden paddle, also provided in the package.

Dresser Manufacturing Division, Bradford, Pa.

Circle No. 8-17 on the convenient reply card facing page 34.



Power Plant

The 2KW electric plant is lightweight, compact and economical in operation. Its K241 engine has ample horsepower (5.6 HP at 1800 RPM) for the rated 2KW output and for intermittent overloads up to 2.5KW. Available in models for automatic, remote, or manual starting and for gasoline or combination gas-gasoline operation, the new plant is adaptable for many applications in industry, in the construction field, for railroads, for fleet and trailer use. The single-phase generator supplies 60-cycle AC current at 115 or 115-230 volts. The single-cylinder, four-cycle engine is of large bore, short stroke design and has automatic spark advance and anti-friction ball bearings at both ends of the crankshaft. Vibro mounts, skid type base, fuel pump, sediment bowl, fuel filter, oil bath air cleaner, and muffler are standard equipment. Reverse cooling, weatherproof housing, and other accessories are offered.

Kohler Co., Kohler, Wis.

Circle No. 8-18 on the convenient reply card facing page 34.



Engineered for continuous duty or for stand-by operation as emergency unit.

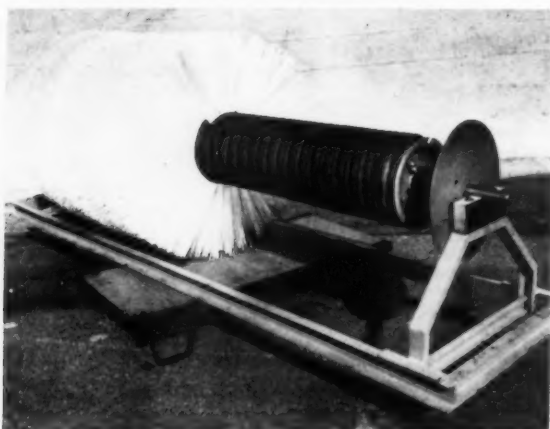
Sewage Plant

A sewage treatment plant to serve small subdivisions, industrial plants, motels, shopping centers and similar projects with population groups ranging from 75 to 3000, the Accelobiox, uses atmospheric oxygen to sustain the organisms which purify the sewage. A Vortair aerator entrains vast quantities of air, and mixes, recirculates sludge and clarifies within a single tank. Because the plant operates without air compressors, there is virtually no noise and little power is required. Operation and maintenance requirements are minimal.

Inflico Inc., Tucson, Arizona.

Circle No. 8-19 on the convenient reply card facing page 34.

Street Broom



Screw on feature saves on time, assures uniform quality.

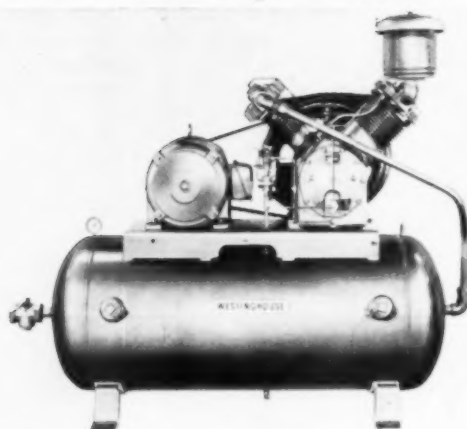
Radax broom bristles are tufted and bound in a continuous steel channel, then coiled to fit the diameter and spiral lead of existing broom core. The broom is delivered in a one-piece spring-like coil, complete with anchor fixture for coil ends, ready to screw onto the core—

just like screwing a nut onto a bolt. Units are disposable when worn out. There is nothing to return for refilling.

Rynal Corporation, 114 Saint Joseph Street, Arcadia, California.

Circle No. 8-20 on the convenient reply card facing page 34.

Air Compressor



Motor reaches full speed before unit starts to pump air.

The model 5YC, a two stage, two cylinder compressor has an unloading system for automatic loadless starting and positive protection against low oil level operation. Rated operating pressures for the unit, using a 10 hp drive, are 125, 175 and 250 psi. Model is also available with a 15 hp drive for 175 psi operation. The compressor has constant speed, start-stop or dual control operation.

Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

Circle No. 8-23 on the convenient reply card facing page 34.

Concrete Gun

These are rigs designed to make possible quick, simple repairs of damaged concrete and have the capability of supplying full concrete gunning capacity for construction work of all kinds with municipal crews. The units, Model C3VM (truck-mounted) and C3TM (trailer-mounted) will shoot concrete at a rate of from eight to twelve tons per hour employing a 365 cfm compressor. They are provided with a paddle mixer, mounted 25 to 30 inches high, which feeds into a belt elevator which in turn conveys the mix to a hopper at the top of the gun itself.

Ridley and Co., Inc., 2217 Pontius Avenue, Los Angeles 64, Cal.

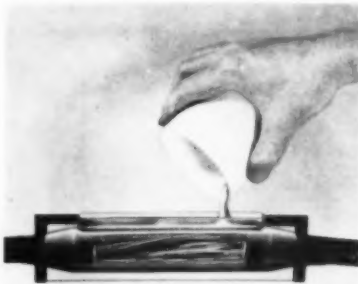
Circle No. 8-21 on the convenient reply card facing page 34.



Compact, continuous-feed operation makes crew training extremely easy.

Cable Splice

Semper-Seal, an epoxy-type resin for use in splicing and plugging signal, communication, and electrical power cables, is a clear, two-part compound that incorporates durability, weather-tight sealing and transparent clarity for cable encapsulation. It is a two-part compound con-



sisting of a resin and hardener which when mixed together create a thermosetting action and in 30-45 minutes, become a solid, clear, air-tight seal. Semper-Seal is furnished in kit form consisting of two separate bottles of resin and hardener, a clear butyrate plastic mold, a paper mixing container and a mixing paddle. Kits are available in 2 to 20 oz. sizes.

C & S Products Company, Windsor Locks, Conn.

Circle No. 8-22 on the convenient reply card facing page 34.

Tractor Mower

For fast, efficient mowing service in municipal and road assignments, the Oliver 770 with Anderson extension mower permits the operator to cut behind guardrails and other obstructions, as well as cut high-angle slopes. The mower can be set for any angle from 90° above to 45° below horizontal, and for any height of up to 116". Travel speeds of 17.31 m.p.h. are possible for quick moves.

The Oliver Corporation, 400 West Madison Street, Chicago 6, Illinois.

Circle No. 8-24 on the convenient reply card facing page 34.



Good weight distribution and stability permit operation on steep slopes.

Wheel Loader

The Caterpillar 944 wheel Traxcavator is powered by a 105 net hp gasoline engine and equipped with an animated 2-yard side dump bucket and two-door cab. A 135 maximum hp D330 diesel engine is also available for the 944.

Caterpillar Tractor Co., Peoria, Ill.

Circle No. 8-25 on the convenient reply card facing page 34.



Animated, two-cubic yard, side dump bucket and 2-door cab are featured.

Butyl Caulk

A joint sealing compound for use in concrete and masonry construction, Sealtight Butyl Caulk, produced from polybutane rubber, is a single-component material that may be applied directly from the container. It is available in two colors, aluminum and white; may be applied by gun or trowel; furnished in five gallon drums, one gallon pails and gun cartridges; may be safely stored; does not require a primer; and will adhere to any reasonably clean surface.

W. R. Meadows, Inc., 26 Kimball Street, Elgin, Illinois.

Circle No. 8-26 on the convenient reply card facing page 34.



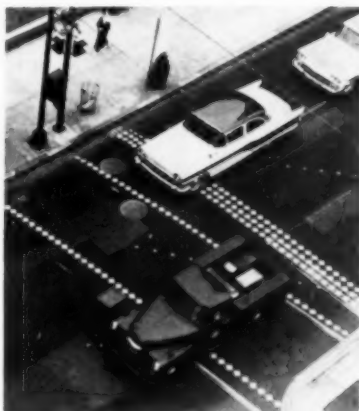
Offers adhesive, cohesive properties.

Marking Material

A permanent-type reflective pavement marking material, "SD" Plastix has a special adhesive backing which permits simple, quick application by unskilled labor, since no advance preparation of the pavement is required. Traffic flow can continue while the installation is being made. The new Plastix has been found to stand up well during winter, surviving snow, ice, chains, snow plows and cinders with no apparent difficulty. The material is furnished in continuous rolls, in 6 x 6, or 6 x 4 blocks, in "Dotties," and in pre-cut legends for school zones, lane lines, turns, and the like. It is available in both white and yellow.

Prismo Safety Corporation, Huntingdon, Pa.

Circle No. 8-27 on the convenient reply card facing page 34.



Ends long drying or setting time and resists slipping and many traffic abuses.

Automatic Plant

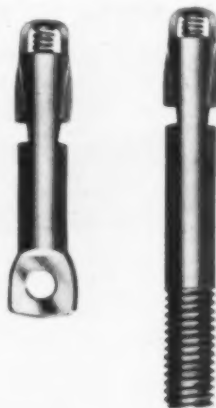
A group of units that can be piped together to handle the successive stages of water treatment necessary for a particular community, is available in a range of sizes. A plant can be assembled out of standard package units according to the type and volume of treatment required. The "package plants" are completely automatic, including the automatic valveless gravity filters. The units include equipment for removal of carbon dioxide, oxidation of ferrous iron or hydrogen sulfide, softening, removal of turbidity, chlorination, and filtration; they are available for plant flows up to 100 gpm.

Permutit Company, 53 West 43rd St., New York 36, N. Y.

Circle No. 8-28 on the convenient reply card facing page 34.

Expansion Bolt

For the installation of a rod hanger or tie wire type expansion bolt, Cram-it is based on the Wej-it reverse cone principle—the greater the strain the tighter the bolt. With Cram-it simply drill the hole in the concrete or other non-frangible material and by hand insert bolt to the desired depth. Bolts slide in easily yet will never pull out and are made



in a variety of sizes and available in all ferrous and non-ferrous metals.

Wej-it Expansion Bolt Co., Inc., Kingston, New York.

Circle No. 8-29 on the convenient reply card facing page 34.

Sprayer-Duster

This turntable machine, Model FST-2, is mounted on a tandem axle trailer having a deck area 72-in. wide by 108-in. long. The 200 gallon stainless steel tank contained in the trailer under the safety plate deck is removable and has a drain cock located at the right rear of the trailer between the step and right rear fender. The pump is a two cylinder pistol type.

Buffalo Turbine Agricultural Equipment Company, Inc., Gowanda, New York.

Circle No. 8-30 on the convenient reply card facing page 34.



Tank has a basket type filler screen.

END LANDFILL PROBLEMS!

Eliminate obnoxious odors,
rodents and vermin from
landfills

POLY-CIDE

A name which includes a variety of laboratory
and field developed formulations designed to
control one or any of these nuisances, quickly,
economically and safely.

Descriptive bulletin sent on request.

®Registered

BROOKS Chemicals, Incorporated
PLANTS
2204 E. 87th St. Cleveland 37, Ohio • 461 Cumberland Ave. Hamilton, Ontario
Offices in Principal Industrial Cities



Water Supply and Purification

by Col. W. A. Hardenbergh

**WATER SUPPLY
and
PURIFICATION**



by
W.A. HARDENBERGH

**A Useful Book
For Your
Engineering Library**

**Only \$7.25
Write to:**

**Book Department
Public Works Magazine
200 South Broad Street
Ridgewood, New Jersey**

AN authoritative yet simple treatment of the subject
by one of the nation's foremost authorities, whose edi-
torial and field work have brought him in close contact
with the problems that trouble the average engineer.
Design examples of all kinds are worked out in detail to
illustrate practical, up-to-date methods.

Among the major changes introduced in this latest
edition are the following: the chapters on ground water,
on filtration, and on laying pipe and maintenance lines
have been almost completely rewritten; the chapters
on pipe conduits and on disinfection have been revised
to bring the material in them up to date and a new
chapter has been added on fluoridation.

Order your copy today

Limited number of copies available in Portuguese.

Plans for a City Improvement Program

An \$800,000 city improvement program feasibility study has been presented to Safety Harbor, Fla., by Briley, Wild and Associates, consulting engineers. The plan calls for additions to the water supply and sewage disposal systems, repair and paving of streets, and improvements in drainage. The \$800,000 total includes refinancing the present city revenue certificate issue of about \$120,000.

The water, sewer and drainage projects, if undertaken, will be financed with revenue certificates and repaid from income from the water and sewer departments. Total cost of water and sewer projects is estimated at \$450,000. Street repairs are estimated at \$36,000 with paving listed for an additional \$65,000. The street and drainage projects would be financed with general obligation bonds. Improvements are planned to care for an estimated population increase, from 2,200 at present to 3,500 in 1990, and will be paid off over the next 30 years.

The advantages listed include increased service and improvements to present residents, attracting new residents and light industry to the city, and savings to the city resulting from the elimination of temporary patchwork on the streets and temporary solutions to the drainage problems.

The plan includes complete treatment of sewage which would eliminate the possibility of the bay being polluted with the effluent from the present primary treatment plant. The present plant would be used with some changes. This extension was part of the planning when the disposal plant was built in 1954 to take care of the area which already had sewers.

There are 641 single family residences; 89 multi-residences; and 58 commercial and industrial units. The city's present assessed valuation is \$3,000,000 having doubled in the past few years. The charter limits the amount of bonds to 30% of the assessed valuation of the city. Should the proposals be put into effect the present revenue certificates of the city would be redeemed. Property taxes are not affected by any part of the plan.

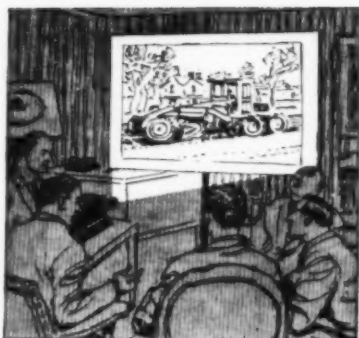
Cost of Sewer Construction

During the year ending Sept. 30, 1959, Fort Worth, Texas, constructed 44.4 miles of sanitary sewers of which 36.7 miles were 10-inch or smaller. However, some large collector mains were built and these were a factor in raising the average cost per foot of sewer from \$5.85 in 1958 to \$6.88 in 1959.

LaGuardia Airport Rehabilitation Underway

A \$734,220 contract for the rehabilitation of the easterly apron of LaGuardia Airport has been awarded by The Port of New York Authority. Work, to be completed by November 1, is a part of the bi-state agency's \$56,000,000 reconstruction and improvement program under way at the airport.

The principal features of the LaGuardia Airport redevelopment program include a new three-story passenger terminal, five times the size of the existing structure; a new 150-foot control tower; a rehabilitated Runway 4-22; an entirely new Runway 13-31; a two-level terminal roadway; and enlarged parking space including a double-decked area adjacent to the new passenger terminal. The redevelopment program will be completed in 1962.



FILMS

in Brief

Listed below are motion picture films of current interest to engineers, administrators and supervisors in the public works field. The companies providing these films have indicated that the films are available for appropriate use by PUBLIC WORKS readers. Requests for films should be made direct to the company listed with the film.

"Seal Coats." Methods and procedures for applying asphalt seal coats and light surface treatments. (16½ min., color, sound, 16 mm.) The Asphalt Institute, University of Maryland, College Park, Maryland.

"Underground Arteries." Graphic presentation of use of Transite Asbestos-Cement Pressure Pipe for municipal water systems suitable for showing to municipal officials, water boards, engineering and technical groups. (36 min., color, sound 16 mm.) Motion Picture Department, Johns-Manville Corp., 22 East 40th Street, New York 16, N. Y.

"Operation-Joint Sealing." Products, equipment and methods for sealing joints and cracks in highway and airfield pavements. (20 min., color, sound.) Paving Products Section, The Flintkote Company, P. O. Box 157, Whippany, New Jersey.

"Collector's Item." Development and use of modern refuse collection and disposal methods in Los Angeles. (32 min., color, sound, 16 mm.) International Harvester Company in care of Modern Talking Picture Service, 21 West 60th St., New York 23, New York.

"Signing of the North Carolina Interstate Highway." (Color, silent, 16 mm.) Pfaff & Kendall, 84 Foundry Street, Newark 5, New Jersey.

"Four Firsts of Motor Maintenance." Portrays the four principal causes of motor breakdowns and how to prevent them. Photographs, supplemented by drawings, show the results of neglect and faulty maintenance. (15 min., black and white, sound slide film—33 1/3 rpm turntable required, 35 mm.) Motion Picture Department, Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

"Sewers, Guardian of Community Health." (30 min., sound 16 mm.) Southern Clay-Pipe Institute, 1401 Peachtree Street, N.E., Atlanta 9, Georgia.

"Crossroads of Light." A film tour of the world-famous Outdoor Lighting Center at Hendersonville, North Carolina. Available from local General Electric Apparatus Sales Division offices or General Electric Company, 300 South Stratford Road, Winston-Salem, North Carolina.

"The Rival World." The story of the insect, a world-wide enemy, its endless attacks, man's counter-attacks, and the means and hope of victory. (25 min., color, sound, 16 mm.) Shell Oil Company, 50 West 50th Street, New York 20, New York.

"Celite, The Story of the Diatom." The mining operations and processing of diatomaceous silica. Animated sequence explaining the process of filtration and the manner in which Celite filter aids contribute to modern, efficient filtration. (33 min., color, sound, 16 mm.) Motion Picture Department, Johns-Manville Corporation, 22 East 40th Street, New York 16, N. Y.

"Fury of the Winds." An Atlantic hurricane is followed from its detection in the Caribbean Sea through its roaring path of destruction across the cities of the Atlantic seaboard. The film also shows how, through proper design, construction and the use of steel, structures can be built to withstand the violence of the hurricane. Bethlehem Steel Company, care of Modern Talking Picture Service, Inc., 3 East 54th Street, New York 22, New York.

"The Story of a Valve." The trials and difficulties from the inventors' idea to the successful mass production of the lubricated plug valve. The many different current uses and applications of the valve are pictorially presented in a coast to coast tour. (30 min., color, sound, 16 mm.) Rockwell Manufacturing Company, 400 North Lexington Avenue, Pittsburgh 8, Pennsylvania.

CLASSIFIED

WANTED DIRECTOR OF PUBLIC WORKS AGE: 32-55

Graduate engineer from an accredited school of engineering with a minimum of 10 years experience in engineering field of which five years must have been in capacity of a chief administrative officer in a public or governmental agency. Salary \$800-\$1,000.

Apply to:
Civil Service Office
City Hall
Lakeland, Florida

WATER UTILITY SUPERINTENDENT

Progressive City of over 30,000 population requires a qualified person who must be a registered professional engineer and have five years or more of supervisory experience in the operation and management of a water utility system having water treatment equipment. Starting salary —\$8,000.00 per year. For application form and job description, write to:

Wausau Water Works
Wausau,
Wisconsin

SEWAGE PLANT OPERATOR

Sewage Plant Operator wanted by the City of Munising. Certified Class "C" license required. Send resume of qualifications and experience. State starting salary required and earliest starting date.

Apply to:
Walter E. Looney
City Manager
City Hall
Munising, Michigan

WANTED

Highway Materials Research Engineer to direct expanding research program. Salary and rank will depend on qualifications. Advanced degree and professional registration desirable.

Write to:
G. A. Riedesel
Director of Industrial Research
Washington State University
Pullman, Washington

CIVIL ENGINEER

Civil Engineer to serve in capacity of Superintendent and Engineer for Sanitary Sewer and Water Works.

Reply to:
South Stickney Sanitary District
7801 S. LaVergne Avenue
Oak Lawn P.O., Illinois
Garden 4-6030

SANITARY ENGINEER

Salary \$9,432—\$11,418

City of Rochester, N.Y. has an opening for a Sanitary Engineer. Requirements in addition to degree, 10 years Sanitary Engineering experience which included 4 years in sewage plant operation. Applications may be obtained and must be filed by August 23, 1960. Examination September 17, 1960.

Write to:
Municipal Civil Service Commission
214 City Hall Annex
Rochester, N.Y.

INDEX OF ADVERTISEMENTS

Adams Company, Inc., R. P.	74	Gar Wood Industries, Inc.	64 & 65	Pak-Mor Manufacturing Co.	40 & 41
Aerquip Corporation 197		Gledhill Road Machinery Co.	55	Palmer Filter Equipment Co.	215
Morman Division		Good Roads Machinery Co.	210	Peerless Pump.	26
Air Placement Equipment Company	61	Hamilton Kent Mfg. Co.	43	Hydrodynamics Division	181
Alabama Pipe Co.	211	Hays Mfg. Company 199		Permutit Division	
Allis-Chalmers 67, 68 & 144		Healy-Ruff Company 187		Pfaudler Permutit Inc.	191
Amercoat Corporation 20		Hell Company 200		Phelps Dodge Refining Corp.	134
American Bitumuls & Asphalt Co.	185	Henry Hudson Hotel 149		Philadelphia Gear Corporation	191
American Cast Iron Pipe Co.	44	Hercules Powder Company 179		Pomona Terra-Cotta Co.	14
Anthraxite Equipment Corp.	76	Hersey-Sparling Meter Co.	131	Portland Cement Association 139 to 142	
Asplundh Chipper Company 232		Holan Corporation 133		Preload Company 175 & 176	
Atlas Mineral Products Co.	174	Subsidiary of The Ohio Brass Co.		Price Brothers Company 213 & 228	
Aurora Pump Division		Hopla-Warner & Swasey Co.	133	Public Works	
New York Air Brake Company	13	Hotel Jefferson 35		Radiator Specialty Company 205	
Eastern Industries, Inc.	14	Hough Company, Frank G.	83	Recordak Corporation 135	
Ayer-McCarrel Clay Co., Inc.	173	Huber-Warco Company 73		Subsidiary of Eastman Kodak Co.	
Badger Meter Mfg. Company	138	Hydro E-Z Pack 58		Republic Steel Corporation 154 & 155	
Baughman Manufacturing Co.	49	Division of Hercules Galion Products, Inc.		Ridge Tool Company 211	
Bethlehem Steel Company 78		Ideal Electric & Mfg. Co.	84	Roberts Filter Mfg. Co.	16
Bison Aluminum Chain Co., Inc.	157	Infila Incorporated 47, 52 & 53		Rohn & Haas Company 38	
Blaw-Knox Equipment Division	14	International Harvester Company		Rynal Corporation 160	
Bowenston Shale Co.	228	Johns-Manville 69 & 177		Seaman-Gunnison 153	
Brooks Chemicals, Inc.	178	Kaul Clay Company 161		Div. of Seaman Corp.	
Buffalo Pipe & Foundry Corp.	45	Kearney & Mattison 24 & 25		Schild Bantam Company 75	
Division of Koehring Company		Kelley Machine Division 211		Shawer Tap Inc.	207
Buffalo Turbine Agricultural Equip Co., Inc.	186	The Wiesner-Papp Co., Inc.		Simalex Valve & Meter Company	58
Byron Jackson Pumps Inc.	21	Kerrigan Iron Works Company 151		A Division of Pfaudler Permutit Inc.	
Calgon Company 156		Kirel, Inc.	177	Smith Mfg. Co., A. P.	183
Cannelton Sewer Pipe Co.	14	Koehring Division 44		Southern Pipe 36 & 37	
Cast Iron Pipe Research Assoc.	8 & 9	Komline-Sanders Engineering Corp.	60	Division of U. S. Industries	
Caterpillar Tractor Co.	4 & 86	Kraloy Plastic Pipe Co.	167	Steel Plate Fabricators Assoc.	196
Caterpillar Tractor Company	12	Laclede Steel Company 66		Steiert & Sons, Inc.	206
Engine Division	195	Layne & Bowler Pump Company	172	Synchro-Start Products, Inc.	160
Chain Belt Company 168		Leece-Neville Company 36 & 57		Tarrant Mfg. Company 146, 207 & 215	
Champion Corporation 27		Lely Ltd.	201	Texas Vitrified Pipe Co.	14
Division of General Motors		Limitorque Corporation 191		Thiokol Chemical Corp.	23
Chicago Bridge & Iron Co.	Third Cover	Marman Division 197		Thompson Pipe & Steel Company	160
Chicago Pneumatic Tool Co.	62	M-B Corporation 164		Trickling Filter Floor Institute 14	
Chicago Pump Co.	3	M & H Valve & Fittings Co.	190	Trojan Division 209	
Clark Company, H. W.	130	McCabe-Powers Body Company 39		Unimasco, Inc.	208
Clark Equipment Company 137		McConaughay, K. E.	143	U. S. Pipe & Foundry Co.	30 & 31
Construction Machinery Div.		Michelin Tire Company 203		Veon Chemical Corporation 50	
Classified Ads 229		Mira-Flex Company, Inc.	204	Vermeer Manufacturing Company	132
Combustion Engineering 32 & 33		Mits & Merrill, Inc.	184	Wacker Corporation 208	
Darling Valve & Manufacturing Co.	182	Mobile Drilling, Inc.	48	Walker Process Equipment Inc.	6
Dempster Brothers 77		Monarch Road Machinery Co.	210	Wallace & Tiernan Co., Inc.	Back Cover
Diamond Alkali Company 147		Morse Boulger, Inc.	128	Warn Mfg. Co., Inc.	199
Dickey Clay Mfg. Co., W. S.	14	Morten Salt Company 11		Warner & Swasey Co.—Hopla	133
Dixon Crucible Co., Joseph 165		Mueller Co.	19 & 169	Warren-Knight? 207	
Dorr-Oliver, Inc.	189	Natco Corp.	14	Waukesha Motor Company 10	
Dresser Manufacturing Division	193	Nichols Engineering & Research Corp.	42	Wausau Iron Works 206	
Earthworm Boring Machine, Inc.	201	Norwalk Company, Inc.	72	Wedge-Lock Clay Pipe Mfgs.	Second Cover
Ecanolite Corporation 145		O'Brien Mfg. Company 163		Weil Pump Company 198	
Ellis & Ford Mfg. Co.	200	O'Carroll 85		Westinghouse Electric Corporation	79 to 82
Fairbanks Morse & Company 28 & 29		Div. of American-Marietta Co.		Wheeler Mfg. Company 214	
Fitchburg Engineering Corp.	51	Oliver Corporation 17		White Diesel Engine Division	13
Flexible Inc.	166	Orangeburg Mfg. Co.	54	The White Motor Company	
Flex-O-Lite Mfg. Company 63		(Div. of The Flintkote Co.)		Whiting Company, E. B. & A. C.	152
Flintkote Co. (Orangeburg Div.)	54	Pacific Flush Tank Co.	159	Wilkinson Products Company 200	
Flynn & Emrich 71		Pacific Pumping Co.	192	Wood Company, R. D.	22
Ford Motor Box Company 180				Woodward Iron Company 59	
Forneys Inc.	205			Wylie Manufacturing Co., Inc.	78
Foundation Well Point Co.	203			Yale & Towne Manufacturing Co.	209
Fox River Tractor Company 18				Zimmer & Francescon 6	
Frink Sno-Plows Inc.	150				

CONSULTING ENGINEERS APPEAR ON PAGES 216 to 221

PUBLIC WORKS JOURNAL CORPORATION

200 South Broad Street

Ridgewood, New Jersey

OFFICERS

W. A. Hardenbergh, President

Lewis C. Morris, Vice President and Treasurer

Edward B. Rodie, Secretary

BUSINESS DEPARTMENT

Lewis C. Morris, General Manager

Arthur K. Akers, Director, Advertising & Research

I. James Barger, Business Manager

ADVERTISING OFFICES

CHICAGO 1, ILLINOIS
333 N. Michigan Avenue
Robert J. Shea
Mid-West Sales Mgr.

CLEVELAND 10, OHIO
Villa Beach 2.
15445 Lake Shore Blvd.
Burton, M. Yost,
District, Manager

LOS ANGELES 36, CALIF.
5478 Wilshire Blvd.
% Smith and Hollyday
Hugh Hollyday
David W. Zander

KANSAS CITY, MO.
4916 West 64th St.
Mission, Kansas
C. H. Stockwell

RIDGEWOOD, NEW JERSEY
200 South Broad Street
W. S. Morris

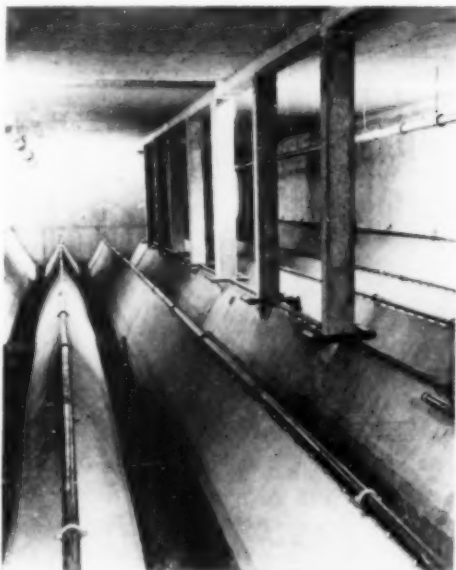
SAN FRANCISCO 4, CALIF.
22 Battery Street
% Smith and Hollyday
Bill Smith

PHILADELPHIA 10, PENN.
1434-36 Land Title Bldg.
Rod Ellis

LONDON, W.1., ENGLAND
Regency House
1 Warwick Street
Norman F. Keenan

—Worth Seeing

This Los Angeles River dam—a giant nylon bag coated with neoprene, 150 feet long and 8 feet high, can be collapsed in 10 minutes when flood stage nears. When in place dam diverts water to settling basins where it seeps into ground. Dam is inflated by pumping it full of water. It was manufactured by The Firestone Tire and Rubber Company.



Each of nine concentration tanks at the new Pittsburgh sewage treatment plant has a spray system utilizing lengths of wrought iron pipe made by A. M. Byers Co. Nozzles are 1 foot apart.



"Turning over the Water Works" to the incoming president of AWWA, C. F. Wertz (left) director of the Miami Water and Sewer Department. Immediate past president is L. W. Grayson, (right).



Aerial view showing a diversion channel under construction at the recent Allis-Chalmers cut and fill farm terracing and soil conservation demonstration in Illinois. Well engineered soil conservation frequently requires extensive use of heavy earthmoving equipment.



Stacking them high in Miami! Two new municipal off-street parking garages will provide nearly 1,000 additional parking spaces. This architect's sketch shows a 422-car garage planned for Biscayne Blvd.

Atlas JC-60®

**STOPS
INFILTRATION**



**... reduces
pumping costs!**

Infiltration of soil water into your sewage system greatly increases pumping and operation costs at the disposal plant. JC-60, a plastic-base sewer jointing compound, stops infiltration by adhering tenaciously to properly primed pipe.

This superior Atlas compound gives adhesion values of over 300 p.s.i. guaranteeing to you permanent bottle-tight joints. You are assured of lower pumping costs and long term service, with a minimum of costly repairs, when you specify JC-60.

Get the complete facts; write for Bulletin M20-3.



by Arthur K. Akers

★ **T. D. Williams** becomes manager, calcium chloride sales, Columbia-Southern Chemical Corp., Pittsburgh, succeeding **Brooks M. Dyer**, made manager, caustic soda sales. **William Staley**, formerly of Philadelphia, assumes Williams' market development responsibilities.

★ **Koehring Co.**, Milwaukee, announces a 4-day construction equipment show in September at their proving grounds near Waukesha, Wis.

★ **Portland Cement Association** news includes **George K. McCord** as Wisconsin District Engineer; **Robert H. Lochow** to similar position in New Jersey. **Charles H. Knight, Jr.**, succeeds Lochow in Seattle as 3-state District Engineer.

★ **Robert B. Bradley** succeeds **Herald T. Reishus** (retired) as vice president and executive head of International Harvester Co.'s Construction Equipment Division.



Mr. Bradley



Mr. Schlenz

★ **Harry E. Schlenz**, president of the Pacific Flush Tank Co., Chicago, appointed to the Steering Committee of President Eisenhower's National Conference on Water Pollution.

★ **Kerrigan Iron Works Co.**, Nashville, Tenn. subsidiary of Rockwell-Standard, announces it is installing machinery for producing seamless, round-tapered aluminum lighting standards.

★ **F. S. Weir** becomes vice president heading the expanded Export Division of Walker Process Equipment, Inc., Aurora, Ill.

★ **Charles Kuhn** is announced as president, Dresser Mfg. Division, Bradford, Pa., succeeding **F. G. Fabian, Jr.**, now executive vice president Dresser Industries, Dallas.

★ **Ralph B. LaBour** appointed general service manager, Tex-Vit Supply Co., Manufacturing Division, Mineral Wells, Texas.

★ **William E. Harrison** is now manager, Washington office, Armeo Drainage and Metal Products, vice David H. Henderson, retired.

★ **Athey Products Corp.**, Chicago, names **John A. Ferguson** sales manager.

★ **William E. Ranck** appointed sales manager, Load-Packer refuse collection bodies, Gar Wood Industries, Inc.

★ **Studebaker-Packard Corp.** initiates a long-range marketing development program under **L. E. Minkel**, newly named vice president of marketing.

★ **Wayne L. Dowdey**, general sales manager, The Eimco Corporation, Salt Lake City, has been elected a vice president. **T. F. Olson** was elected financial vice president and **Dr. Don Dahlstrom** of the Palatine, Ill., Research and Development Center becomes a vice president.

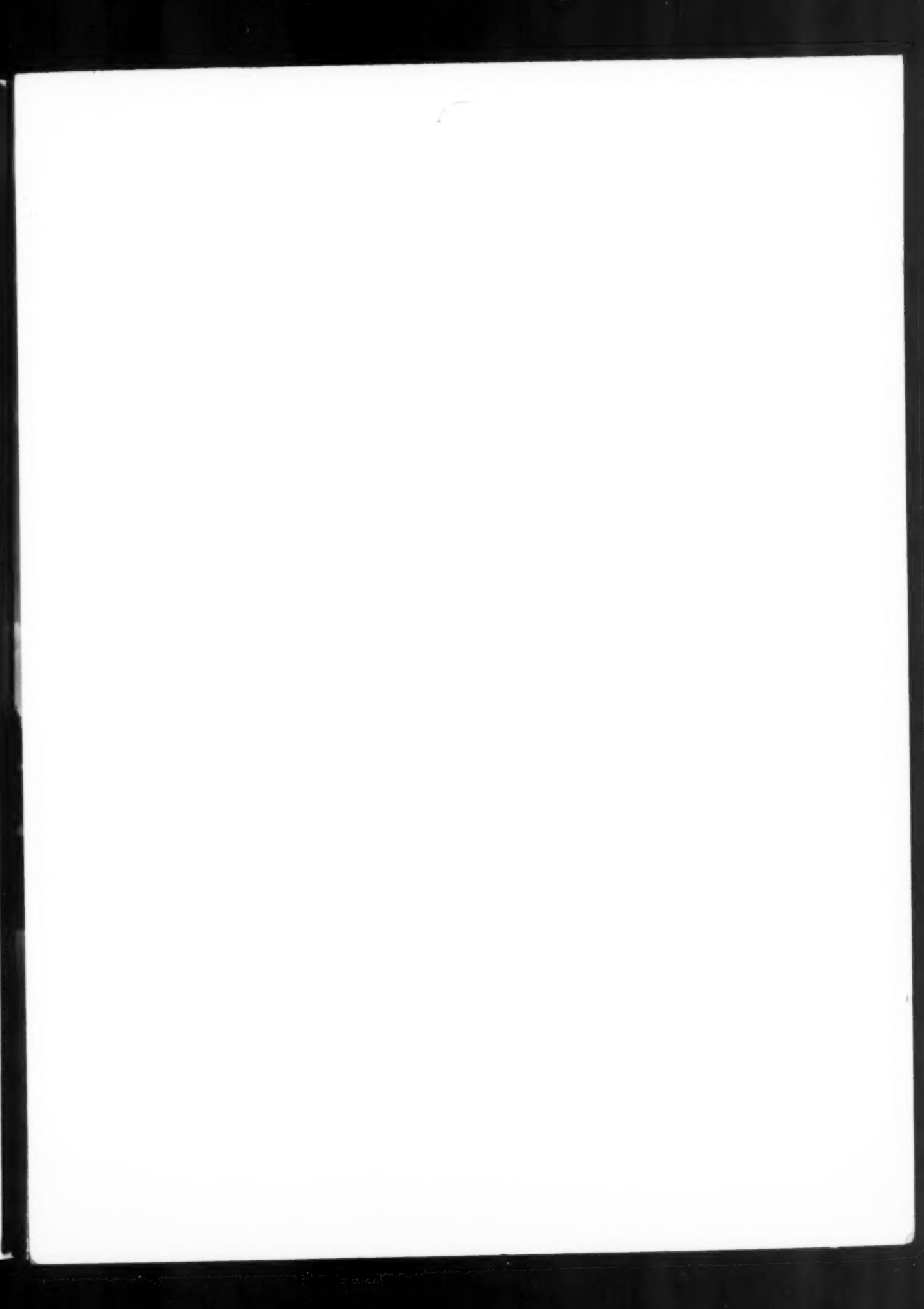
★ **Glen Tableman** is named manager of sales, W-K-M Division of ACF Industries, Houston, Texas.

★ **George S. Trees** succeeds **Donald A. Leach**, retiring as a vice president and regional sales manager, Chicago Bridge & Iron Co., Chicago.

★ **C. Freeman** succeeds **M. E. Ziegenhagen** as manager advertising and sales promotion, Worthington Corp., Harrison, N. J.

★ Mom wept copiously at daughter's wedding. "Don't take on so," comforted Pop. "Sure we lose our little girl, but—we gain a bathroom, two closets and use of the telephone."

—Huber-Warco News





PUBLIC SERVANT

This 1,500,000-gallon Horton Spheroidal elevated steel water tank was designed and built by CB&I to serve the City of Wheaton, Illinois. It is 130 feet to bottom . . . has a 30-foot range in head.

Horton Spheroidals, introduced by CB&I in 1958, are built in standard capacities ranging from 200,000 to 3,000,000 gallons. Contact our nearest office for full details.

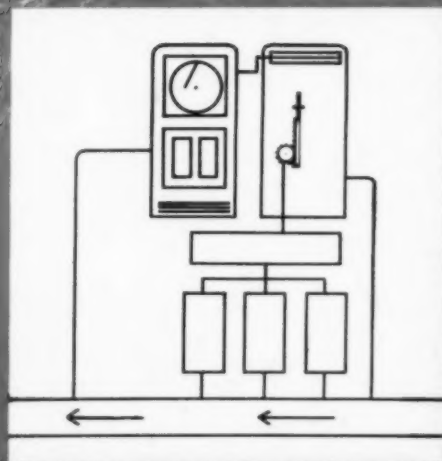
CHICAGO BRIDGE & IRON COMPANY

332 SOUTH MICHIGAN AVENUE
CHICAGO 4, ILLINOIS



OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

Let
automation
stretch the
FLEXIBILITY
of your
chlorination
system...



W&T

COMPOUND-LOOP CONTROL

Compound-loop Control by Wallace & Tiernan maintains chlorine residuals automatically—provides utmost flexibility in arrangement and process control.

Chlorinator feed rate is adjusted by two signals: one from water flow, the other from continuous, automatic residual analysis. Since feed rate is the product of these signals, Compound-loop Control gives you a range of greater than 100:1. No matter how much flow or demand changes, your system always maintains the selected residual.

Regardless of the size, type, or physical layout of your system, Compound-loop Control adapts readily. Electric, pneumatic, or variable vacuum control signals can be used. And you can install Compound-loop Control as a package or convert to it, component by component, as your system expands.

For more information, write Dept. S-145.78



WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY



